GRAND CANYON
FISHERIES INTEGRATED DATABASE

Phase I: A Catalogue of Fisheries Data From Grand Canyon

DRAFT 1

BIO/WEST, Inc.

Resource Management and Problem Solving Services

Report No. TR-250-11
BIO/WEST, Inc.

GRAND CANYON FISHERIES INTEGRATED DATABASE

Phase I: A Catalogue of Fisheries Data From Grand Canyon

DRAFT 1

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July 1, 1994

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INTRODUCTION

This document is the Phase I report submitted to Bureau of Reclamation by BIO/WEST, Inc. in partial fulfillment of Contract No. 0-CS-40-09110, Modification No. 015, entitled Grand Canyon Fisheries Integrated (GCFIN) Database. This report describes and catalogues the databases used by ongoing fisheries researchers in Grand Canyon and identifies common elements among those different databases.

BACKGROUND

The Glen Canyon Environmental Studies (GCES) has coordinated collection of virtually all fisheries data and information from the Colorado River and its tributaries in Grand Canyon over the last decade. These studies were formulated by the Department of Interior on December 8, 1982, and have involved numerous agencies, universities, and private groups. Significant data were collected under Phase I of GCES, from 1983 to 1987, and are currently being collected under Phase II. Prior to GCES, fisheries investigations were conducted independently by numerous individuals, universities, and agencies. The recent and ongoing data are computerized, but much of the historic data have not been assimilated or computerized.

Fisheries information available from Grand Canyon ranges from historic notations by early canyon pioneers to detailed habits of individual fish, using technology such as radiotelemetry. These more recent and ongoing studies are designed to precisely document the life histories and ecology of these fish, and often involve large and complex databases, gathered for a variety of purposes and by a large number of people. A centralized database, with access to all of the fisheries data, is critical to aid managers in accessing information for making decisions that affect fishery resources in Grand Canyon.

A similar integrated database is being developed by the Navajo Nation Natural Heritage Program (NHP) for the Little Colorado River (LCR). Data storage formats and database structures are similar to those identified and developed for the databases contained in this document, and facilitate integration. BIO/WEST has met with the NHP to insure integration and compatibility of databases.

OBJECTIVES

This document constitutes the first of three phases for the GCFIN Database. A description of the project is provided in the Technical Proposal (Valdez and Hougaard 1993). The objectives of Phase I are as follows:

1. Procure documented database structures and accompanying sample datasets from each fishery researcher in Grand Canyon, with assistance from GCES.

2. Describe and catalogue data structures from each researcher database.

3. Identify field formats and data codes common to databases.

OVERVIEW OF DATABASES

This overview includes the study objectives for each research entity and a general description of the associated database. In the general database description are the software used to enter, store, maintain, and analyze the data as well as two lists of database specifications. The first is a list of the project file names and a description of the contents of each file. The second lists, for each file, the number of records currently in the file, the length of each record in characters or numeric digits, the size of the file in bytes, and the anticipated number of file records at the conclusion of the study. Most of the information in this overview was received directly from each investigator.

ARIZONA GAME AND FISH DEPARTMENT

Study Objectives

The objectives of the Arizona Game and Fish Department (AGFD) studies are (Arizona Game and Fish Department 1990):

Objective 3.1: Continue the AGFD monitoring and research program for native fishes of the Colorado River and its tributaries in Grand Canyon,

Objective 3.2: Identify temporal and spatial distribution patterns and movements of early life stages of fishes in the Little Colorado River and, if necessary, other tributaries,

Objective 3.3: Provide for the propagation of native fishes of the Colorado River in Grand Canyon for use in laboratory or hatchery based studies necessary to satisfy the needs of the Section 7 Conservation Measures,

Objective 3.4: Determine changes in environmental conditions in mainstream and tributary confluence zone native fish rearing habitats under different flow regimes,

Objective 3.5: Determine algal and invertebrate standing crops and their relative contributions to diets of young native fishes in tributary, backwater, and mainchannel habitats under different flow regimes,

Objective 3.6: Determine the behavioral responses of larval to juvenile native fishes to changing environmental conditions in rearing habitats during controlled flows,

Objective 3.7: Determine age structure and growth rates of native fishes of the Colorado River in Grand Canyon. Relate these life history features to hydrologic and thermal conditions experienced by the fishes during their growth to present size,

Objective 3.8: Compare otolith edge chemistry of native fishes collected in tributary and mainstream habitats for use in growth and movement analysis,

Objective 3.9: Determine the extent to which limnological factors, with emphasis on water chemistry and aquatic productivity, potentially limit the distribution and abundance of native

fishes in the Little Colorado River and other tributaries which might serve as streams for augmentation of humpback chub in Grand Canyon.

General Description of Database

AGFD's database consists of two sets of data files, one for Little Colorado River native fish studies and one for mainstem Colorado River native fish studies. AGFD uses dBASE IV and Foxpro on DOS-based personal computers to store and maintain data, and dBASE IV and SPSS/PC+ for data analysis. Their preferred data distribution format is dBASE IV.

Little Colorado River Native Fish Studies

File Name	Contents
ALGEMAS1.DBF	Algae chlorophyll analysis data; grids and quarterly, 1993
ALGAECOL.DBF	Algae and benthos collections (quarterly trips), 1991-1993
QBENTHOS.DBF	Quarterly benthos analysis data, 1993
BEHAVIOR.DBF	Behavioral data, 1991-1993
DRFTMAST.DBF	Drift analysis data, quantification of taxa, 1991-1993
DRIFTBIO.DBF	Drift biomass data, 1991-1993
HABITAT.DBF	Larval fish habitat data (grids), 1993
AVAILABL.DBF	Longitudinal habitat availability data, 1992-1993
HABUSE.DBF	Longitudinal habitat use data, 1993
LARVPRES.DBF	Longitudinal survey presence/absence data 1992
PRES193.DBF	Longitudinal survey presence/absence data 1993
MAS1FC93.DBF	Fish collections data, 1993
MASTFC92.DBF	Fish collections data, 1992
MASTFC91.DBF	Fish collections data, 1991
MASTERFC.DBF	Fish collections data, 1991-1993
VISCMAST.DBF	Viscera analysis data, 1988-1993
MOVEMAS1.DBF	Larval fish movement data (traps), 1993
FCHABUSE.DBF	Fish collections habitat use data, 1991-1993
* plus two database files that have not yet been created:	
HABPHOTO.DBF	Habitat photograph analysis (grids), 1993
HABZOOPL.DBF	Habitat zooplankton analysis (grids), 1993

File Name	# Records	Record Length	Size (bytes)	Anticipated # Records
ALGEMAS1.DBF	574	122	70990	574
ALGAECOL.DBF	433	68	30182	433
QBENTHOS.DBF	156	128	20930	200
BEHAVIOR.DBF	335	457	155113	400
DRFTMAST.DBF	4989	82	410028	6000
DRIFTBIO.DBF	891	146	131464	1500
HABITAT.DBF	1049	144	152370	1049
AVAILABL.DBF	9378	80	750914	9378
HABUSE.DBF	11084	89	987278	11084
LARVPRES.DBF	3202	59	189368	3202
PRES193.DBF	4339	70	304244	4339
MAS1FC93.DBF	7820	163	1276038	18000
MASTFC92.DBF	4530	163	739768	4530

MASTFC91.DBF	8632	163	1408394	8632
MASTERFC.DBF	20982	163	3421444	31162
VISCMAST.DBF	3488	168	586978	4500
MOVEMAS1.DBF	729	109	80519	729
FCHABUSE.DBF	630	24	15346	10000

Mainstem Colorado River Native Fish Studies

File Name	Contents
ALLSONDE.DBF	Data from Hydrolab DataSondes
A_MASTER.DBF	Type A sample habitat data
BENTMAST.DBF	Benthos data
DIET_ANA.DBF	Fish diet analysis (stomach samples)
FISH_ALL.DBF	Fish capture data
MAP.DBF	Plane table mapping data
MAST_ALL.DBF	Master data sheet data
OPP_ALL.DBF	Opportunistic sampling data
PLANKTON.DBF	Plankton data
PRB3.DBF	Type B sample habitat data
SEDIMENT.DBF	Sediment data

File Name	# Records	Record Length	Size (bytes)	Anticipated # Records
ALLSONDE.DBF	8325	57	475071	30000
A_MASTER.DBF	840	82	69586	1200
BENTMAST.DBF	1538	60	92666	3000
DIET_ANA.DBF	69	53	322	1500
FISH_ALL.DBF	19323	62	1198604	30000
MAP.DBF	242	110	27294	400
MAST_ALL.DBF	862	87	76020	1200
OPP_ALL.DBF	1189	126	150776	1500
PLANKTON.DBF	4137	20	82998	15000
PRB3.DBF	7014	47	330204	7014
SEDIMENT.DBF	506	56	28626	750

ARIZONA STATE UNIVERSITY

Study Objectives

The objectives of Arizona State University's (ASU) investigation are best described in their July 1990 Technical Proposal (Douglas and Marsh 1990):

> "Although research to date has provided valuable information pertaining to life history and ecology of humpback chub in the Grand Canyon, a number of critically important questions remain unresolved, and data are required for future management of this unique and imperiled species. In particular, the duration and extent of movements by juvenile and adult humpback chub in the LCR, and their span of residency within that river are generally unknown, as is the basic reproductive biology of this fish.

Investigations that will quantitatively define these major life-history characteristics are the focus of this research proposal."

General Description of Database

ASU's data are stored in ASCII files on an IBM 3090 mainframe computer. ASU uses the Wylbur mainframe editor to enter and maintain data, and Statistical Analysis System (SAS) for analysis. Their data distribution format is ASCII files. The file names listed below were assigned by Bio/West since the actual file names were not provided in the ASU database documentation.

File Name	Contents
ASU91.DAT	Fish collection data, 1991
ASU92.DAT	Fish collection data, 1992
ASU93.DAT	Fish collection data, 1993

File Name	# Records	Record Length	Size (bytes)	Anticipated # Records
ASU91.DAT	10151	65	~659815	10151
ASU92.DAT	9120	65	~592800	9120
ASU93.DAT	8941+	65	~581165+	>8941

U.S. FISH AND WILDLIFE SERVICE

Study Objectives

The objectives of U.S. Fish and Wildlife Service (USFWS) fishery studies for Glen Canyon Environmental Studies (GCES) Phase II are (Gorman 1994):

1. Determine habitat use by humpback chub and other native fishes (Table 1) in the Little Colorado River (LCR).

2. Evaluate the potential for establishing a second spawning aggregation of humpback chub in other tributaries of the Grand Canyon.

3. From the perspective of habitat requirements, evaluate how the humpback chub and native fishes are affected by the operation of the Glen Canyon Dam.

The major purpose of USFWS studies is to address the following reasonable and prudent alternatives proposed by USFWS (Revision of Reasonable and Prudent Alternative, Draft Biological Opinion, Operation of Glen Canyon Dam, 2-21-93-F-167; USFWS, Arizona Ecological Services Office, Phoenix, Arizona 85019):

2. Protect the humpback chub spawning population and habitat in the LCR and develop and implement a management plan for this river (this corresponds to GCES Conservation Measure 4).

3. Implement long-term monitoring to track the status of endangered and native fishes in the Grand Canyon; implement studies to determine responses and impacts of Glen Canyon Dam operations on endangered and native fishes in the Grand Canyon (this corresponds to GCES Conservation Measures 5 and 6).

4. Develop actions that will help ensure the continued existence of razorback sucker in the Grand Canyon.

5. Make every effort to establish a second spawning aggregation of humpback chub in the Grand Canyon (this corresponds to GCES Conservation Measure 7).

6. Assess the potential effects of a multi-level intake structure (MLIS) on Glen Canyon Dam to endangered and native fishes of the Grand Canyon.

7. Develop an adaptive management plan that will provide for adequate studies to review impacts to endangered and native fishes of the Grand Canyon and recommend actions to further their conservation (this is the same as GCES Conservation Measures 5 and 6).

The USFWS GCES Phase II study program is split into two components to address the reasonable and prudent alternatives listed above:

1. Habitat use by humpback chub and other native fishes in the LCR. The largest concentration of successfully reproducing humpback chub throughout their native range occurs in the LCR. In the LCR our studies focus on describing habitat use by all post larval stages of humpback chub, including spawning habitat. Our findings will serve as a model for evaluating other tributaries in the Grand Canyon for their potential to support secondary reproducing populations of humpback chub.

2. Habitat studies on the smaller tributaries of the Colorado River in the Grand Canyon to evaluate their potential for establishing secondary reproducing aggregations of humpback chub.

The specific objectives of the LCR studies are:

1. Describe and determine the availability of aquatic habitats on a seasonal basis.

2. Describe seasonal patterns of distribution and habitat use by YOY, juvenile, and adult native fishes.

3. Identify humpback chub spawning habitat in the LCR.

4. Predict the effects of seasonal and intermittent high discharges on habitat availability in the LCR by river modeling studies.

The specific objectives of the tributary studies are:

1. Describe and determine the availability of aquatic habitats on a seasonal basis.

2. Determine seasonal patterns of distribution and habitat use by native and exotic fishes.

3. Identify information and future studies required for possible enhancement of environmental conditions to protect and promote fish and wildlife populations in tributaries of the Colorado River.

General Description of Database

We do not have this information at this time.

BIO/WEST

Study Objectives

This mainstem investigation is being conducted by Bio/West (B/W), concurrently with AGFD. Tributary studies by USFWS, AGFD, and ASU, in cooperation with the Navajo Nation, the Hopi Tribe, and the Hualapai Tribe, are designed to complement the mainstem studies. These entities, together with the National Park Service (NPS), Reclamation, and GCES, comprise the Aquatic Coordination Team (ACT)--a body of researchers that coordinate aquatic studies and advise GCES. The objectives of the combined humpback chub investigations are as follows:

Objective 1: To determine the ecological and limiting factors of all life stages of humpback chub in the mainstem Colorado River, Grand Canyon, and the effects of Glen Canyon Dam operations on the humpback chub.

1A: Determine resource availability and resource use (habitat, water quality, food, etc.) of humpback chub in the mainstem Colorado River.

1B: Determine reproductive capacity and success of humpback chub in the mainstem Colorado River.

1C: Determine survivorship of early stages of humpback chub in the mainstem Colorado River.

1D: Determine distribution, abundance and movement of humpback chub in the mainstem Colorado River, and effects of dam operations on the movement and distribution of humpback chub.

1E: Determine important biotic interactions with other species for all life stages of humpback chub.

Objective 2: Determine the life history schedule for the Grand Canyon humpback chub population.

2A: Develop or modify an existing population model from empirical data collected during the study for use in analyses of reproductive success, recruitment and survivorship.

General Description of Database

The B/W Grand Canyon fisheries studies consist of two parts, the Mainstem Humpback Chub Studies and the Hualapai Aquatic Resources Studies. Several aspects of the two investigations are conducted similarly, such as fish sampling and water quality collections, so the file structures for those data are nearly identical for the two projects. The humpback chub studies include additional information, such as chub morphometric and meristic measurements, chub scales and stomach contents, radiotelemetry observation, surveillance, and remote data, and Geographic Information System (GIS) data. The GIS data are distinct from the rest in that they are visual, rather than tabular. The GIS products are in the process of being developed, so the quantity of GIS data is only an estimate at this time. B/W enters and maintains its tabular databases using dBASE IV, and uses dBASE IV and SYSTAT for data analysis. Some GIS products are being developed at GCES, but those developed at B/W are digitized using ARC/CAD software on an IBM compatible PC. They are then maintained and further developed using ARC/INFO software on a Sun Sparcstation 2.

Mainstem Humpback Chub Studies

File Name	Contents
NETTING.DBF	Netting and trapping sample data, Oct 1990 - Nov 1993
ELECTRO.DBF	Electrofishing sample data, Oct 1990 - Nov 1993
SEINE.DBF	Seining sample data, Oct 1990 - Nov 1993
CHUB.DBF	Humpback Chub morphometrics and meristics, Oct 1990 - Nov 1993
FISH.DBF	All fish capture data, Oct 1990 - Nov 1993
SURVEIL.DBF	Radiotelemetry surveillance, Oct 1990 - Nov 1992
OBSERV_H.DBF	Header for radiotelemetry observations, Oct 1990 - Nov 1992
OBSERV_M.DBF	Movement for radiotelemetry observations, Oct 1990 - Nov 1992
SCALES.DBF	Humpback Chub scale analyses, Oct 1990 - Nov 1993
JUVHAB.DBF	Juvenile habitat measurements, Oct 1990 - Nov 1993
DRIFT.DBF	Drift net sample analysis data, Oct 1990 - Nov 1993
FOOD.DBF	Stomach pumping analysis data, 1993
REMOTE.DBF	Remote radiotelemetry station data, Oct 1990 - Nov 1992
DATASOND.DBF	Datasonde water quality data, Oct 1990 - Nov 1993
SURVEYOR.DBF	Surveyor II water quality data, Oct 1990 - Nov 1993

File Name	# Records	Record Length	Size (bytes)	Anticipated # Records
NETTING.DBF	16643	192	3080614	16643
ELECTRO.DBF	4612	182	850018	4612
SEINE.DBF	958	217	202814	958
CHUB.DBF	6294	214	1235258	6294
FISH.DBF	26542	163	4194948	26542
SURVEIL.DBF	1600	111	290626	1600
OBSERV_H.DBF	260	206	29854	260
OBSERV_M.DBF	2025	149	302975	2025
SCALES.DBF	157	133	22099	157
JUVHAB.DBF	282	155	44832	282
DRIFT.DBF	570	218	125030	570
FOOD.DBF	552	253	142570	552
REMOTE.DBF	26583	14	452493	26583
DATASOND.DBF	43586	45	2000000	43586
SURVEYOR.DBF	5161	51	265000	5161

Visual Data	Description
Sampling Location Maps	Net and trap locations plotted on orthophotos
Surficial Habitat Maps	Surficial hydraulic features outlined on aerial photos for four selected sites
Hydraulic Maps	Surficial hydraulic features and shoreline types mapped on orthophotos from LCR to Tanner
Bathymetric Maps	Bathymetry and topo for LCR confluence and rm 58.5, 60.1, 60.8, 64.7
Velocity Maps	Velocities for rm 58.5, 60.1, 60.8, 64.7
Substrate Maps	Substrates outlined for LCR confluence
Temperature Maps	Temperature isopleths for LCR confluence
Fish Photographs	Digitized fish slides

Visual Data	# Files	Anticipated Size (bytes)
Sampling Location Maps	2	~1000000
Surficial Habitat Maps	27	~100000
Hydraulic Maps	2	~3000000
Bathymetric Maps and topo (LCR confluence)	15	~12000000
Velocity and bathymetry maps (rm 58.5, 60.1, 60.8, 64.7)	250	~2000000
Substrate Maps	1	~45000
Temperature Maps	67	~190000
Fish Photographs	240	depends on resolution

Hualapai Aquatic Resources Studies

File Name	Contents
NETTING.DBF	Netting and trapping sample data, May 1992 - Dec 1994
ELECTRO.DBF	Electrofishing sample data, May 1992 - Dec 1994
SEINE.DBF	Seining sample data, May 1992 - Dec 1994
FISH.DBF	All fish capture data, May 1992 - Dec 1994
DRIFT.DBF	Drift net sample data, May 1992 - Dec 1994
DATASOND.DBF	Datasonde water quality data, May 1992 - Dec 1994
SURVEYOR.DBF	Surveyor II water quality data, May 1992 - Dec 1994

File Name	# Records	Record Length	Size (bytes)	Anticipated # Records
NETTING.DBF	1202	213	267869	2000
ELECTRO.DBF	520	214	121311	800
SEINE.DBF	197	234	57374	300
FISH.DBF	3010	216	612975	4750
DRIFT.DBF	138	318	44654	220
DATASOND.DBF	1954	45	90000	3070
SURVEYOR.DBF	243	51	12500	380

UNIVERSITY OF ARIZONA

Study Objectives

We do not have this information at this time.

These studies led to four Master of Science theses: Weiss 1993, Allen 1993, Otis 1994, and Mattes 1993.

General Description of Database

We do not have this information at this time.

HISTORICAL COLLECTIONS

In addition to research currently underway are numerous historical fisheries studies, collections, and observations. The data associated with these historical records range from archaeological finds to personal communications to computerized databases. Table 1 is a summary of historical fisheries records for Grand Canyon and includes the source of the information, any citations for it, whether there is associated location information, and a description of the data. This information was compiled from Valdez et al (1991) and Kubly (1990).

The computerized databases resulted from Carothers et al (1981), Kaeding and Zimmerman (1983), and Maddux et al (1987) and are described by Kubly (1990). These databases are held by AGF and are stored in dBASE files. We do not know the sizes of these historical files at this time, but the following is a list of the file names and a description of the file contents.

File Name	Contents
MNACATCH.DBF	Carothers et al catch file
LKRARE.DBF	Kaeding and Zimmerman rare file
LKPHYS.DBF	Kaeding and Zimmerman physical file
LKCATCH.DBF	Kaeding and Zimmerman catch file
AGFDLARV.DBF	AGFD larval fish file
AGFDHAB.DBF	AGFD habitat file
AGFCATCH.DBF	AGFD catch file

Table 1. Historical records of humpback chub in the Colorado River in Grand Canyon.

Source	Citation	Location	Data Description
Kolb and Kolb 1914	Kolb and Kolb (1914)	X	Reported as "bonytails", photos
Grand Canyon National Park 1944; N.N. Dodge	Miller (1946)	X	Two complete bodies, one partial specimen used to describe species
R.R. Miller 1955	Miller (1955)	X	Remains from archaeological site
Wallis, O.L. 1955	Kubly (1990)	X	Reported occurrence
Woodbury 1959	Woodbury (1959)	X	Reported occurrence
McDonald and Dotson	McDonald and Dotson (1960)	X	Reported occurrence
Arizona State University, 1963	-	X	specimen
J.L. Stone 1964	Stone (1964)		Reported angler catch
J.L. Stone 1966	Stone (1966)		Reported angler catch
Stone and Queenan	Stone and Queenan (1967)		Reported angler catch
Grand Canyon National Park 1968		X	
Miller and Smith	Miller and Smith (1968)	X	Reported occurrence
AGFD Personnel	Stone and Rathbun (1967-69)		Reported occurrence
Holden and Stalnaker 1967-73	Holden and Stalnaker (1975)	X	Reported occurrence
Museum of Northern Arizona 1970		X	
Museum of Northern Arizona 1971		X	
R.R. Miller 1975	Miller (1975 a,b)	X	Reported occurrence
C.O. Minckley 1975	Minckley and Blinn (1976)	X	Reported as "Gila elegans"
Suttkus et al 1970-76	Suttkus et al (1976)	X	Reported occurrence; museum specimens collected
Suttkus and Clemmer 1976	Suttkus and Clemmer (1977)	X	Reported occurrence; museum specimen collected
C.O. Minckley 1977	Minckley (1977)	X	Reported occurrence

Source	Citation	Location	Data Description
C.O. Minckley 1976-77	Minckley (1979)	X	Reported occurrence
Euler	Euler (1978)	X	remains
Carothers and Minckley 1977-78	Carothers and Minckley (1981)	X	complete data set
Kaeding and Zimmerman 1979-81	Kaeding and Zimmerman (1983)	X	complete data set
Miller and Smith 1984	Miller and Smith (1984)	X	remains
Jones 1985	Jones (1985)	X	remains
D. Pearson, Eric's Building Supply, Flagstaff, AZ 1985	Personal observation		
Maddux et al 1984-86	Maddux et al (1987)	X	complete data set
Kubly 1990	Kubly (1990)	X	complete data set
Law, M. 1990		X	
B. Mitchell, Fredonia, AZ 1991	Personal observation	X	

DATABASE STRUCTURES AND RELATIONAL LINKS

This section describes each database in detail. First, the file structures are defined, including the name of each field, what type of data is in that field (i.e. numeric, character, date), the size of the field (number of characters or digits), how many decimal places, if any, and a description of the data stored in that field. ASU's data are not stored in dBASE files, but we use the same designators to describe it.

After the structures are described for each researcher's data, the relational links between their different files are defined. A relational link is a way of connecting two files that contain different information in order to access the information simultaneously. The two files must have one or more fields in common, as this field or set of fields serves as the link between the files. For example, a researcher may want to know the specific fish capture information for fish caught in nets in a particular habitat type. Figure 1 illustrates this example for the B/W database. The NETTING and FISH files can be linked by a set of fields that uniquely identifies netting samples and the fish captured in those samples (i.e. sample type, trip number, sample number, etc). The fields of interest in each of the files could then be viewed on the screen or written to another file for analysis.

FIGURE 1 HERE

Building on this example, a researcher may then want to know what kinds of food were found in the stomachs of fish caught in that particular habitat. Multiple files can be linked simultaneously, so the fish whose stomach contents were collected could be linked by the PIT_TAG and DATE fields to the file containing the food analysis data. And again, the desired information could be displayed on the screen or written to yet another file. Figure 2 illustrates this additional link.

FIGURE 2 HERE

Another possible scenario for linking would be to display the net set locations with GIS for humpback chub captured. The CHUB and NETTING files can be linked as described above, then the net locations linked with the GIS sample location data by the unique sample location identifier, MAP_ID_NUM, and those net locations displayed on the GIS map. Figure 3 illustrates this GIS linking example.

FIGURE 3 HERE

For each researcher's database, then, we list the names of the files that can be linked, and the fields used for linking them.

ARIZONA GAME AND FISH DEPARTMENT

File Structures

Little Colorado River Native Fish Studies

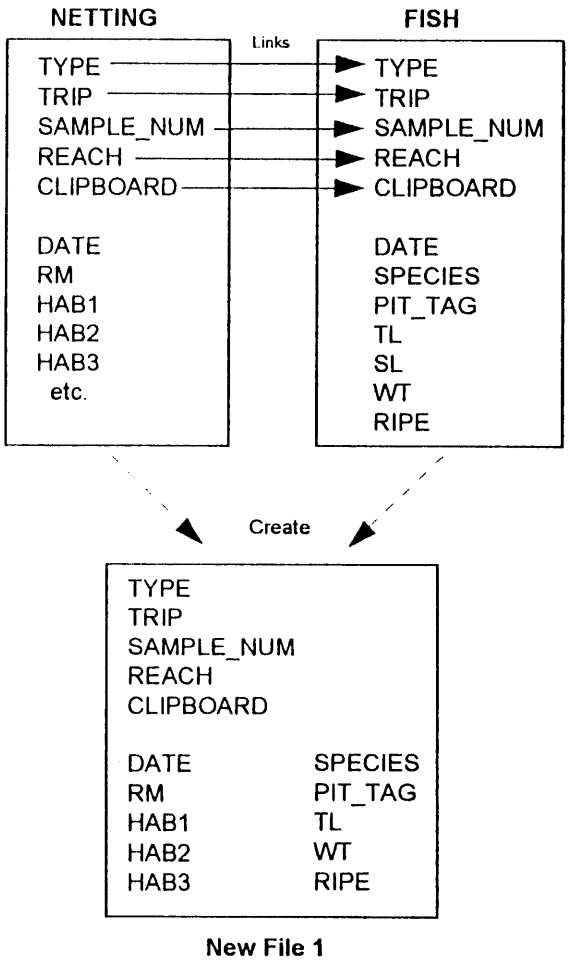

Figure 1. Example of linking NETTING and FISH files in BIO/WEST database

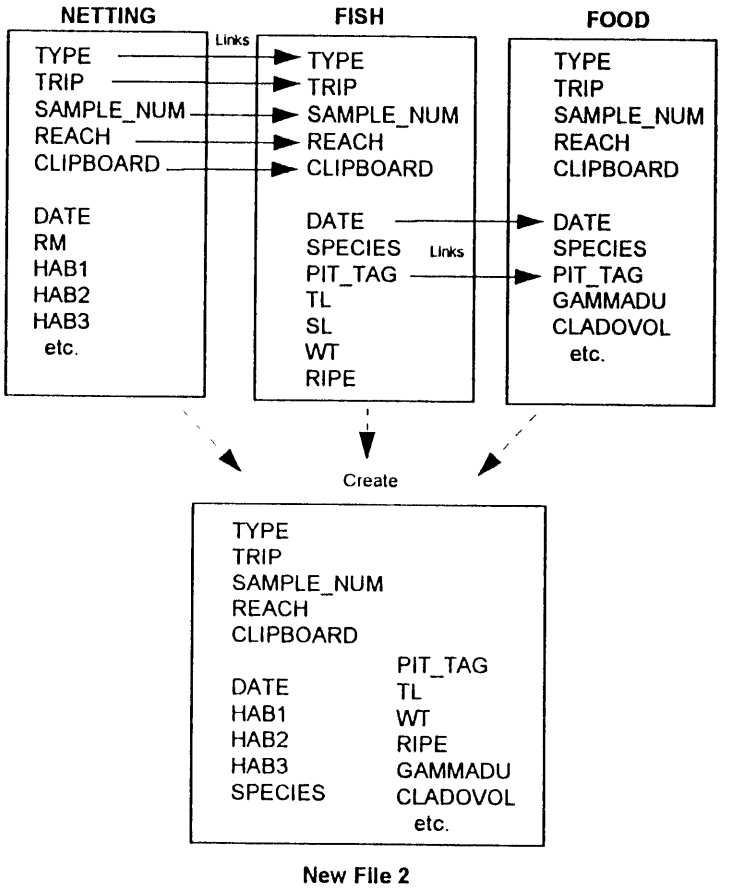

Figure 2. Example of linking NETTING, FISH, and FOOD files in BIO/WEST database

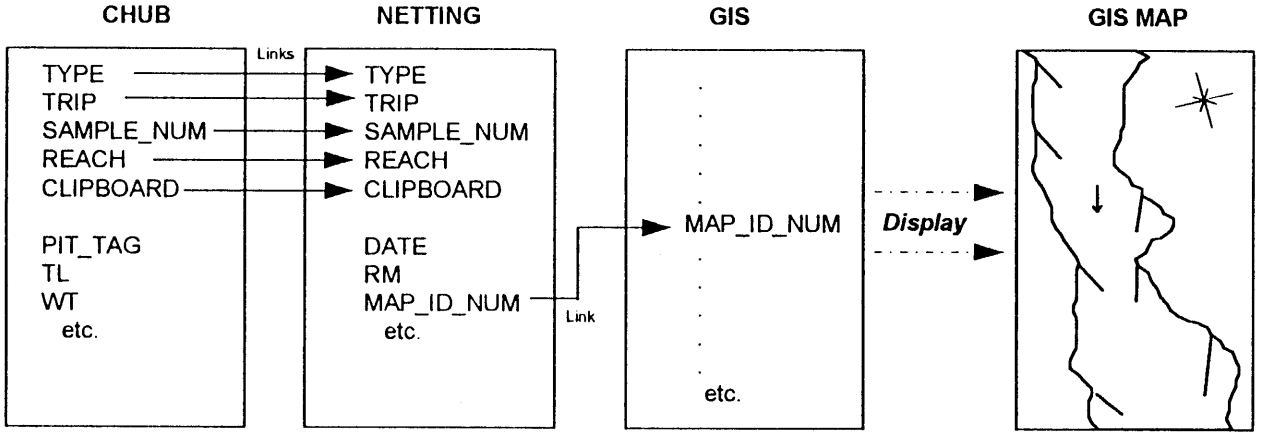

Figure 3. Example of linking CHUB, NETTING and GIS files in BIO/WEST database

File: **ALGEMAS1.DBF**
Contents: **Algae chlorophyll analysis data; grids and quarterly, 1993**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD study number
PAGE	N	3	0	Page of data sheets
REACH	N	2	0	Colorado River Reach 22=Little Colorado River
ANALYST	C	3	0	Person who analyzed sample
ANAL_MO	N	2	0	Month analyzed
ANAL_DA	N	2	0	Day analyzed
ANAL_YR	N	2	0	Year analyzed
SET_MO	N	2	0	Month of collection
SET_DA	N	2	0	Day of collection
SET_YR	N	2	0	Year of collection
SET_HR	N	2	0	Hour of collection
SET_MM	N	2	0	Minute of collection
METER	N	5	0	Meter above mouth
SIDE	C	1	0	Side of river: R=right, L=left, C=center
CELL_NO	C	5	0	Sample or cell number
XTR_VOL	N	3	0	Volume of methanol (ml) for chlorophyll extraction
B480	N	5	3	Pre-acidification absorbance, 480 nm, +-.001 nm
B7501	N	5	3	Pre-acidification absorbance, 750 nm, +-.001 nm
B666	N	5	3	Pre-acidification absorbance, 666 nm, +-.001 nm
B7502	N	5	3	Pre-acidification absorbance, 750 nm #2, +-.001 nm
A7501	N	5	3	Post-acidification absorbance, 750 nm, +-.001 nm
A666	N	5	3	Post-acidification absorbance, 666 nm, +-.001 nm
A7502	N	5	3	Post-acidification absorbance, 750 nm #2, +-.001nm
CRUC_NO	N	4	0	Crucible number, used to burn sample
CRUC_WEIGH	N	9	4	Crucible weight, +-.0001 g
DRY_WEIGHT	N	9	4	Dry weight of sample, +-.0001 g
ASH_WEIGHT	N	9	4	Ash weight of sample, +-.0001 g
CHNGDATE	D	8	0	Date of record change
CHNGTIME	N	4	0	Time of record change

File: **ALGAECOL.DBF**
Contents: **Algae and benthos collections (quarterly trips), 1991-1993**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD Study Number
PAGE	N	3	0	Page of data sheets
MILE	N	5	0	Meters upstream from mouth
SET_MO	N	2	0	Month of collection
SET_DA	N	2	0	Day of collection
SET_YR	N	2	0	Year of collection
SET_HR	N	2	0	Hour of collection
SET_MM	N	2	0	Minute of collection
GEAR_TYP	C	2	0	Gear type code
HABCHAN	C	2	0	Channel type code
HABTYPE	C	2	0	Primary habitat code
SUBS1	C	2	0	Primary substrate code
SUBS2	C	2	0	Secondary substrate code
DISTANCE	N	4	1	Distance from shore (m), to the nearest dm
DEPTH	N	3	0	Depth (cm), to the nearest cm
FLOW	N	5	2	Flow (m/s) +-.015 m/s
AMOUNT	N	2	0	Amount of sample collected (cc), if core sample.
PHOTO_ROLL	N	2	0	Film roll number
PHOTO_NO	N	2	0	Photograph number
SAMP_NO	C	4	0	Sample number
CHNGDATE	D	8	0	Date of record change
CHNGTIME	N	4	0	Time of record change

File: **QBENTHOS.DBF**
Contents: **Quarterly benthos analysis data, 1993**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD study number
PAGE	N	3	0	Page of data sheets
MILE	N	5	0	Meter above confluence
SET_MO	N	2	0	Month of sample collection
SET_DA	N	2	0	Day of sample collection
SET_YR	N	2	0	Year of sample collection
SET_HR	N	2	0	Hour of sample collection
SET_MM	N	2	0	Minute of sample collection
HABCHAN	C	2	0	Channel type code
HABTYPE	C	2	0	Primary habitat type code
HABTY2	C	2	0	Secondary habitat type code
SIDE	C	1	0	Side of river: R=right, L=left, C=center
SUBS1	C	2	0	Primary substrate code
SUBS2	C	2	0	Secondary substrate code
DISTANCE	N	4	1	Distance from shore (m)
DEPTH	N	3	0	Depth (cm)
FLOW	N	6	2	Current velocity (m/s), +-.01m/s
SAMP_NO	C	3	0	Sample number
ANALYST	C	3	0	Person who analyzed sample
DATE_ANAL	N	6	0	Date analyzed
TAXA	C	3	0	Taxa code
LIFE_STAGE	C	1	0	Life Stage
NO	N	20	2	Number per taxa and life stage
DRY_WEIGHT	N	8	3	Dry weight (g) of sample+crucible, +-.0001g
ASH_WEIGHT	N	8	4	Ash weight (g) of sample+crucible, +-.0001g
CRUC_WGHT	N	8	4	Crucible weight (g), +-.0001g
CRUC_NO	N	8	4	Number assigned to crucible
CHNGDATE	D	8	0	Date record was changed
CHNGTIME	N	4	0	Time record was changed

File: **BEHAVIOR.DBF**
Contents: **Behavioral data, 1991-1993**

Field	Type	Size	Dec	Description
MILE	N	8	0	Meter above mouth
SIDE	C	9	0	Side of river: R=right, L=left, C=center
RUN_MO	N	2	0	Month of observations
RUN_DA	N	2	0	Day of observations
RUN_YR	N	2	0	Year of observations
RUN_HR	N	2	0	Hour of observations
RUN_MM	N	2	0	Minute of observations
SPECIES	C	9	0	Species code
LENGTH	N	8	0	Length interval code (mm)
HABCHAN	C	9	0	Channel type code
HABTYPE	C	5	0	Habitat type code
HM	N	4	0	Hectometer above the mouth
NUM	N	5	0	Number assigned to habitat
POOL_DIM	N	8	0	Pool dimensions (squared cm)
OBSERVER	C	9	0	Observer
AREA	N	8	0	Area covered by fish (squared cm)
CALCIUM	N	8	4	Percent of time feeding on the calcium carbonate
CLAY	N	8	4	Percent of time feeding on the clay
SILT	N	8	4	Percent of time feeding on the silt
SAND	N	8	4	Percent of time feeding on the sand
ROCK	N	8	4	Percent of time feeding on the rock
ALGAE	N	8	4	Percent of time feeding on the algae
MAC	N	8	4	Percent of time feeding on the macrophyte
SURFACE	N	8	4	Percent of time feeding on the surface
COLUMN	N	8	4	Percent of time feeding in the water column
SWIM	N	8	4	Percent of time swimming
SCHOOL	N	8	4	Percent of time schooling
CHASER	N	8	4	Percent of time chasing another fish
CHASEE	N	8	4	Percent of time being chased by another fish
OTHER	N	8	4	Percent of time doing any other behavior
DEPTH	N	8	4	Depth of fish at behavior change (code)
TOTAL	N	8	0	Total percent = 100
TCC	N	8	0	Total seconds feeding in calcium carbonate
TCL	N	8	0	Total seconds feeding in clay
TSI	N	8	0	Total seconds feeding in silt
TSA	N	8	0	Total seconds feeding in sand
TRO	N	8	0	Total seconds feeding in rock
TALG	N	8	0	Total seconds feeding in algae
TMAC	N	8	0	Total seconds feeding in macrophytes
TSUR	N	8	0	Total seconds feeding on the surface
TCOL	N	8	0	Total seconds feeding in the water column
TSWIM	N	8	0	Total seconds swimming
TSCH	N	8	0	Total seconds schooling
TCHER	N	8	0	Total seconds chasing another fish
TCHEE	N	8	0	Total seconds being chased by another fish
TO_	N	8	0	Total seconds doing any other behavior
FCC	N	8	0	Frequency of feeding in calcium carbonate
FCL	N	8	0	Frequency of feeding in clay
FSI	N	8	0	Frequency of feeding in silt
FSA	N	8	0	Frequency of feeding in sand

FRO	N	8	0	Frequency of feeding in rock
FALG	N	8	0	Frequency of feeding in algae
FMAC	N	8	0	Frequency of feeding in macrophytes
FSUR	N	8	0	Frequency of feeding on the surface
FCOL	N	8	0	Frequency of feeding in the water column
FSWIM	N	8	0	Frequency of swimming
FSCH	N	8	0	Frequency of schooling
FCHER	N	8	0	Frequency of chasing another fish
FCHEE	N	8	0	Frequency of being chased by another fish
FO	N	8	0	Frequency of doing any other behavior
CHNGDATE	D	8	0	Date of record change
CHNGTIME	N	4	0	Time of record change

File: **DRFTMAST.DBF**
Contents: **Drift analysis data, quantification of taxa, 1991-1993**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD study number
PAGE	N	3	0	Page of data sheets
MILE	N	5	0	Meter above the mouth
SET_MO	N	2	0	Month net set
SET_DA	N	2	0	Day net set
SET_YR	N	2	0	Year net set
SET_HH	N	2	0	Hour net set
SET_MM	N	2	0	Minute net set
HABCHAN	C	2	0	Channel type code
HABTYPE	C	2	0	Primary habitat type code
HABTY2	C	2	0	Secondary habitat type code
SIDE	C	1	0	Side of river: R=right, L=left, C=center
DISTANCE	N	4	2	Distance from shore (m)
DEPTH	N	3	0	Depth (cm), to the nearest cm
FLOW_INIT	N	4	2	Flow (m/s) at time of net set
FLOW_END	N	4	2	Flow (m/s) at time of net run
SUBSAMPLE	N	1	0	Fraction of sample analyzed, denominator
AMOUNT	N	3	0	Duration of net set, minutes
NUMBER	N	3	0	Sample number
ANALYST	C	3	0	Person who analyzed sample
ANAL_MO	N	2	0	Month analyzed
ANAL_DA	N	2	0	Day analyzed
ANAL_YR	N	2	0	Year analyzed
TAXA	C	3	0	Taxa, a three letter code
LIFE_STAGE	C	1	0	Life stage code
NO	N	4	0	Number counted in subsample
CHNGDATE	D	8	0	Date of record change
CHNGTIME	N	4	0	Time of record change

File: **DRIFTBIO.DBF**
Contents: **Drift biomass data, 1991-1993**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD study number
PAGE	N	3	0	Page of data sheets
MILE	N	5	0	Meter above mouth
SET_MO	N	2	0	Month net set
SET_DA	N	2	0	Day net set
SET_YR	N	2	0	Year net set
SET_HH	N	2	0	Hour net set
SET_MM	N	2	0	Minute net set
HABCHAN	C	2	0	Channel type code
HABTYPE	C	2	0	Primary habitat type code
HABTY2	C	2	0	Secondary habitat type code
SIDE	C	1	0	Side of river: R=right, L=left, C=Center
DISTANCE	N	4	2	Distance from shore (m)
DEPTH	N	3	0	Depth (cm), to the nearest cm
FLOW_INIT	N	4	2	Flow (m/s) at net set
FLOW_END	N	4	2	Flow (m/s) at net pull
SUBSAMPLE	N	1	0	Fraction of sample analyzed, denominator
AMOUNT	N	3	0	Duration of net set (minutes)
NUMBER	N	3	0	Sample number
ANALYST	C	3	0	Person who analyzed sample
ANAL_MO	N	2	0	Month analyzed
ANAL_DA	N	2	0	Day analyzed
ANAL_YR	N	2	0	Year analyzed
DATE	N	6	0	Date analyzed
SAMP_NO	N	3	0	Sample number
SUB_TOP	N	1	0	Subsample fraction, numerator
SUB_BOTT	N	1	0	Subsample fraction, denominator
TAXA	C	3	0	Taxa code, three letters
LIFE_STAGE	C	1	0	Life stage code
NO	N	4	0	Number counted per subsample
TLV	N	4	0	Total volume
SUBVOL	N	3	0	Liquid subsample volume burned
CRUC_WEIGH	N	9	4	Crucible weight (g), +-.0001g
CRUC_NO	N	3	0	Number assigned to specific crucible
DRY_WEIGHT	N	9	4	Dry weight (g), sample+crucible; +-.0001g
ASH_WEIGHT	N	9	4	Ash weight (g), sample+crucible; +-.0001g
ANLYST	C	3	0	Person who burned sample
DATE_BURN	N	6	0	Date burned
VERSION	N	1	0	Version of data set, number for each modification
STATUS	C	2	0	Status of data file; Initials of modifier
CHG_DATE	D	8	0	Date record was changed
CHG_TIME	C	8	0	Time record was changed

File: **HABITAT.DBF**
Contents: **Larval fish habitat data (grids), 1993**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD study number
PAGE	N	3	0	Page of data sheets
RUN_MO	N	2	0	Month data recorded
RUN_DA	N	2	0	Day data recorded
RUN_YR	N	2	0	Year data recorded
RUN_TIME	N	4	0	Time data recorded
MILE	N	5	0	Meters above the mouth
SIDE	C	1	0	Side of river: R=right, L=left, C=center
FWS	C	3	0	Fish and Wildlife Service transect number
HABTYPE	C	2	0	Primary habitat type code
FISH	C	1	0	Fish present?: Y=yes, N=no
PHOTOS	C	1	0	Photographs taken?: Y=yes, N=no
ROLL_NO	C	4	0	Film roll number
START_MO	N	2	0	Month began taking pictures
START_DA	N	2	0	Day began taking pictures
START_YR	N	2	0	Year began taking pictures
START_TIME	N	4	0	Time of day began taking pictures
END_MO	N	2	0	Month finished taking pictures
END_DA	N	2	0	Day finished taking pictures
END_YR	N	2	0	Year finished taking pictures
END_TIME	N	4	0	Time of day finished taking pictures
CELL	C	2	0	Grid cell code
TIME_AM	N	4	0	Time in morning that recorded minimum temperature
C_MIN	N	4	1	Minimum temperature (C)
TIME_PM	N	4	0	Time in afternoon that recorded maximum temp.
C_MAX	N	4	1	Maximum temperature (C)
VOL_FILTER	N	2	0	Volume of water filtered (ml), zooplankton sample
SUBS1	C	2	0	Primary substrate code
SUBS2	C	2	0	Secondary substrate code
DEPTH	N	5	1	Depth (cm), to the nearest cm
M_SEC	N	5	2	Current velocity (m/s), +-.015 m/s
SEC	N	3	0	Number of seconds it took bead to traverse dist.
FEATURE1	C	2	0	Primary feature code
FEATURE2	C	2	0	Secondary feature code
FEATURE3	C	2	0	Tertiary feature code
FEATURE4	C	2	0	Quaternary feature code
ALGAE	C	1	0	Algae collected: check if yes
COMMENTS	C	30	0	Comments
CHNGDATE	D	8	0	Date of record change
CHNGTIME	N	4	0	Time of record change

File: **AVAILABL.DBF**
Contents: **Longitudinal habitat availability data, 1992-1993**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD study number
PAGE	N	3	0	Page of data sheets
RUN_MO	N	2	0	Month data recorded
RUN_DA	N	2	0	Day data recorded
RUN_YR	N	2	0	Year data recorded
MILE	N	5	0	Meter above the mouth
SIDE	C	1	0	Side of river: R=Right, L=Left, C=Center
FWS	C	3	0	Fish and Wildlife Service transect number
CM_SHORE	N	4	0	Distance from shore (cm)
DEPTH	N	3	0	Depth (cm)
FLOW	N	5	2	Flow (m/s)
SUBS1	C	2	0	Primary substrate code
SUBS2	C	2	0	Secondary substrate code
FEATURE1	C	2	0	Primary feature code
FEATURE2	C	2	0	Secondary feature code
FEATURE3	C	2	0	Tertiary feature code
FEATURE4	C	2	0	Quaternary feature code
COMMENTS	C	20	0	Comments
CHNGDATE	D	8	0	Date of record change
CHNGTIME	N	4	0	Time of record change

File: **HABUSE.DBF**
Contents: **Longitudinal habitat use data, 1993**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD study number
PAGE	N	3	0	Page of data sheets
RUN_MO	N	2	0	Month data recorded
RUN_DA	N	2	0	Day data recorded
RUN_YR	N	2	0	Year data recorded
MILE	N	5	0	Meter above the mouth
SIDE	C	1	0	Side of river: R=Right, L=Left, C=Center
FWS	C	3	0	Fish and Wildlife Service transect number
TRANSECT	N	1	0	Transect number
CM_SHORE	N	3	0	Distance from shore (cm)
DEPTH_CM	N	3	0	Depth (cm)
FLOW	N	6	2	Flow (m/s), +-.015 m/s
SUBS1	C	2	0	Primary substrate code
SUBS2	C	2	0	Secondary substrate code
FEATURE1	C	2	0	Primary feature code
FEATURE2	C	2	0	Secondary feature code
FEATURE3	C	2	0	Tertiary feature code
FEATURE4	C	2	0	Quaternary feature code
COLLECT	C	1	0	Collect?: Y=yes, N=no
NO_COLL	N	2	0	Number Collected
HEADSTOM	C	5	0	Sample code
COMMENTS	C	20	0	Comments
CHNGDATE	D	8	0	Date of record change
CHNGTIME	N	4	0	Time of record change

File: **LARVPRES.DBF**
Contents: **Longitudinal survey presence/absence data 1992**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD study number
PAGE	N	3	0	Page of data sheets
RUN_MO	N	2	0	Month data recorded
RUN_DA	N	2	0	Day data recorded
RUN_YR	N	2	0	Year data recorded
HM	N	3	0	Hectometer above the mouth
SIDE	C	1	0	Side of river: R=right, L=left, C=center
PRESENCE	C	1	0	Are fish present?: Y=yes, N=no
COLLECT	C	1	0	Collect?: Y=yes, N=no
PRESERVE	C	1	0	Preservative type: E=ethanol, F=formalin
COMMENTS	C	25	0	Comments, includes sample number
CHNGDATE	D	8	0	Date of record change
CHNGTIME	N	4	0	Time of record change

File: **PRES193.DBF**
Contents: **Longitudinal survey presence/absence data 1993**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD study number
PAGE	N	3	0	Page of data sheets
RUN_MO	N	2	0	Month data recorded
RUN_DA	N	2	0	Day data recorded
RUN_YR	N	2	0	Year data recorded
HM	N	3	0	Hectometer above the mouth
SIDE	C	1	0	Side of river: R=right, L=left, C=center
PRESENCE	C	1	0	Presence or absence: +=present, -=absent
COLLECT_	C	1	0	Fish collected?: Y=yes, N=no
MILE	N	5	0	Meter above mouth that fish was collected
NO_COLLE	N	2	0	Number of fish collected
HEADSTOM	C	5	0	Sample code
COMMENTS	C	25	0	Comments
CHNGDATE	D	8	0	Date record was changed
CHNGTIME	N	4	0	Time record was changed

File: **MAS1FC93.DBF**
Contents: **Fish collections data, 1993**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD study number
PAGE	N	3	0	Page of data sheets
REACH	N	3	0	Colorado River reach, 22=Little Colorado River
LINE	N	3	0	Line of data on data sheet
MILE	N	8	2	Meter upstream from mouth
SIDE	C	1	0	Side of river: L=left, R=right, C=center
FWS	C	3	0	Fish and Wildlife Service transect number
SET_MO	N	2	0	Month net set
SET_DA	N	2	0	Day net set
SET_YR	N	2	0	Year net set
SET_HR	N	2	0	Hour net set
SET_MM	N	2	0	Minute net set
GEAR_TYP	C	2	0	Gear type code
GEAR_H	N	2	0	Gear height (ft), to the nearest ft
GEAR_L	N	3	0	Gear length (ft), to the nearest ft
GEAR_M	N	7	5	Gear mesh (inches), to the hundredths of an inch
SEINE_L	N	7	5	Length of seine haul (m), to nearest m
SEINE_W	N	7	5	Width of seine haul (m), to nearest m
HABCHAN	C	2	0	Channel type code
HABTYPE	C	2	0	Primary habitat type code
HABTY2	C	2	0	Secondary habitat type code
SPECIES	C	3	0	Species code, three letters
LENGTH	N	4	0	Total length of fish (mm), to the nearest mm
WEIGHT	N	5	0	Weight of fish (g), +-1 g
SEX	C	1	0	Sex code
MATURITY	N	1	0	Maturity code
PARASITE	N	2	0	Numbers of parasites (interval code)
TAGNUM	C	0	0	Tag number
MARK_REC	C	1	0	Mark or Recapture: M=mark, R=recapture
OLDTAG	C	1	0	Old tag = floy or carlin, present?: Y=yes, N=no
HEADSTOM	C	5	0	Sample collection code
HEAD_NUM	N	5	0	Head sample number
STOM_NUM	N	5	0	Stomach sample number
DISPOSE	C	2	0	Disposition of fish
RUN_MO	N	2	0	Month that net was run
RUN_DA	N	2	0	Day that net was run
RUN_YR	N	2	0	Year that net was run
RUN_HR	N	2	0	Hour that net was run
RUN_MM	N	2	0	Minute that net was run
COMMENTS	C	25	0	Comments
CHNGDATE	D	8	0	Date record was changed
CHNGTIME	N	4	0	Time record was changed

File: **MASTFC92.DBF**
Contents: **Fish collections data, 1992**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD study number
PAGE	N	3	0	Page of data sheet
REACH	N	3	0	Colorado River reach: 22 = Little Colorado River
LINE	N	3	0	Record line, from data sheet
MILE	N	8	2	Meter above mouth
SIDE	C	1	0	Side of River: R=right, L=left, C=center
FWS	C	3	0	Fish and Wildlife Service transect number
SET_MO	N	2	0	Month net set
SET_DA	N	2	0	Day net set
SET_YR	N	2	0	Year net set
SET_HR	N	2	0	Hour net set
SET_MM	N	2	0	Minute net set
GEAR_TYP	C	2	0	Gear type code
GEAR_H	N	2	0	Gear height (feet), to the nearest ft
GEAR_L	N	3	0	Gear length (feet), to the nearest ft
GEAR_M	N	7	5	Gear mesh (inches), to the hundredth of an inch
SEINE_L	N	7	5	Seine length (m), to the nearest meter
SEINE_W	N	7	5	Seine width (m), to the nearest meter
HABCHAN	C	2	0	Channel type code
HABTYPE	C	2	0	Primary habitat type code
HABTY2	C	2	0	Secondary habitat type code
SPECIES	C	3	0	Species code
LENGTH	N	4	0	Total length (mm)
WEIGHT	N	5	0	Weight (g), +-1g
SEX	C	1	0	Sex code
MATURITY	N	1	0	Maturity code
PARASITE	N	2	0	Numbers of parasites (interval code)
TAGNUM	C	10	0	Tag number
MARK_REC	C	1	0	Mark or recapture?: M=mark, R=recapture
OLDTAG	C	1	0	Old tag (external)?: Y=yes, N=no
HEADSTOM	C	5	0	Sample number
HEAD_NUM	N	5	0	Head (otolith) sample number
STOM_NUM	N	5	0	Stomach sample number
DISPOSE	C	2	0	Disposition
RUN_MO	N	2	0	Month net was run
RUN_DA	N	2	0	Day net was run
RUN_YR	N	2	0	Year net was run
RUN_HR	N	2	0	Hour net was run
RUN_MM	N	2	0	Minute net was run
COMMENTS	C	25	0	Comments
CHNGDATE	D	8	0	Date record was changed
CHNGTIME	N	4	0	Time record was changed

File: **MASTFC91.DBF**
Contents: **Fish collections data, 1991**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD study number
PAGE	N	3	0	Page of data sheets
REACH	N	3	0	Colorado River Reach: 22= Little Colorado River
LINE	N	3	0	Data line, from data sheet
MILE	N	8	2	Meter above mouth
SIDE	C	1	0	Side of river: R=right, L=left, C=center
FWS	C	3	0	Fish and Wildlife Service transect number
SET_MO	N	2	0	Month net set
SET_DA	N	2	0	Day net set
SET_YR	N	2	0	Year net set
SET_HR	N	2	0	Hour net set
SET_MM	N	2	0	Minute net set
GEAR_TYP	C	2	0	Gear type code
GEAR_H	N	2	0	Gear height (feet), to the nearest ft
GEAR_L	N	3	0	Gear length (feet), to the nearest ft
GEAR_M	N	7	5	Gear mesh (inches), to the hundredths of an inch
SEINE_L	N	7	5	Length of seine haul (m) to the nearest meter
SEINE_W	N	7	5	Width of seine haul (m) to the nearest meter
HABCHAN	C	2	0	Channel type code
HABTYPE	C	2	0	Primary habitat type code
HABTY2	C	2	0	Secondary habitat type code
SPECIES	C	3	0	Species code
LENGTH	N	4	0	Total length of individual (mm)
WEIGHT	N	5	0	Weight of individual (g) +-1g
SEX	C	1	0	Sex code
MATURITY	N	1	0	Maturity code
PARASITE	N	2	0	Number of parasites, interval code
TAGNUM	C	10	0	Tag number
MARK_REC	C	1	0	Mark or recapture?: M=mark, R=recapture
OLDTAG	C	1	0	Old external tag present? Y=yes, N=no
HEADSTOM	C	5	0	Collected sample code
HEAD_NUM	N	5	0	Collected head sample number
STOM_NUM	N	5	0	Collected stomach sample number
DISPOSE	C	2	0	Disposition
RUN_MO	N	2	0	Month net was run
RUN_DA	N	2	0	Day net was run
RUN_YR	N	2	0	Year net was run
RUN_HR	N	2	0	Hour net was run
RUN_MM	N	2	0	Minute net was run
COMMENTS	C	25	0	Comments
CHNGDATE	D	8	0	Date of record change
CHNGTIME	N	4	0	Time of record change

File: **MASTERFC.DBF**
Contents: **Fish collections data, 1991-1993**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD study number
PAGE	N	3	0	Page of data sheets
REACH	N	3	0	Colorado River reach: 22=Little Colorado River
LINE	N	3	0	Line of data on data sheet
MILE	N	8	2	Meter above mouth
SIDE	C	1	0	Side of river: R=right, L=left, C=center
FWS	C	3	0	Fish and Wildlife Service transect number
SET_MO	N	2	0	Month of net set
SET_DA	N	2	0	Day of net set
SET_YR	N	2	0	Year of net set
SET_HR	N	2	0	Hour of net set
SET_MM	N	2	0	Minute of net set
GEAR_TYP	C	2	0	Gear type code
GEAR_H	N	2	0	Gear height (ft)
GEAR_L	N	3	0	Gear length (ft)
GEAR_M	N	7	5	Gear mesh (in)
SEINE_L	N	7	5	Length of seine haul
SEINE_W	N	7	5	Width of seine haul
HABCHAN	C	2	0	Channel type code
HABTYPE	C	2	0	Primary habitat type code
HABTY2	C	2	0	Secondary habitat type code
SPECIES	C	3	0	Species code
LENGTH	N	4	0	Total length (mm)
WEIGHT	N	5	0	Weight (g), +-1g
SEX	C	1	0	Sex code
MATURITY	N	1	0	Maturity code
PARASITE	N	2	0	Number of parasites
TAGNUM	C	0	0	Tag number
MARK_REC	C	1	0	Mark or recapture? M=mark, R=recapture
OLDTAG	C	1	0	Old external tag? Y=yes, N=no
HEADSTOM	C	5	0	Sample code
HEAD_NUM	N	5	0	Head sample code
STOM_NUM	N	5	0	Stomach sample code
DISPOSE	C	2	0	Disposition code
RUN_MO	N	2	0	Month net run
RUN_DA	N	2	0	Day net run
RUN_YR	N	2	0	Year net run
RUN_HR	N	2	0	Hour net run
RUN_MM	N	2	0	Minute net run
COMMENTS	C	25	0	Comments
CHNGDATE	D	8	0	Date of record change
CHNGTIME	N	4	0	Time of record change

File: **VISCMAST.DBF**
Contents: **Viscera analysis data, 1988-1993**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD study number
PAGE	N	3	0	Page of data sheets
DATE	N	6	0	Date sample collected
TIME	N	4	0	Time sample collected
STOMNUM	C	4	0	Stomach number
SPECIES	C	3	0	Species code
REACH	N	3	0	Colorado River reach: 22 = Little Colorado River
MILE	N	5	0	Meter above confluence
LENGTH	N	3	0	Total length (mm)
WEIGHT	N	4	0	Weight (g), +-1g
GEAR	C	2	0	Gear type code
SEX	C	1	0	Sex code
TOTGONAD	N	7	2	Total gonad weight
EGGS	N	6	2	Weight per 100 eggs
MAT	N	1	0	Maturity code
PARCODE	C	1	0	Number of parasites (interval code)
COMMENTS	C	30	0	Comments
MEATYPE	C	1	0	Viscera content measurement type
GUTFULL	N	6	2	Initial gut fullness
DATANAL	N	6	0	Date analyzed
BY	C	3	0	Person who performed the analysis
TAXA	C	3	0	Taxonomic code
LIFE	C	1	0	Life stage code
NUMBER	N	4	0	Number of each taxa found in gut
VOLUME	N	6	2	Volume or weight of each taxa in gut
COMMENT2	C	30	0	Comments
STATUS	C	1	0	Status of data file
CHG_DT	D	8	0	Date of record change
CHG_TIME	C	8	0	Time of record change
VERSION	N	2	0	Version of data file

File: **MOVEMAS1.DBF**
Contents: **Larval fish movement data (traps),1993**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD study number
PAGE	N	3	0	Page of data sheets
METER	N	5	0	Meter above mouth
SIDE	C	1	0	Side of river: R=right, L=left, C=center
FWS	C	3	0	Fish and Wildlife Service transect number
HAB_TYPE	C	2	0	Habitat type code
SET_MO	N	2	0	Month trap set
SET_DA	N	2	0	Day trap set
SET_YR	N	2	0	Year trap set
SET_HR	N	2	0	Hour trap set
SET_MM	N	2	0	Minute trap set
RECORDER	C	3	0	Person who recorded data
RUN_MO	N	2	0	Month trap was run
RUN_DA	N	2	0	Day trap was run
RUN_YR	N	2	0	Year trap was run
RUN_HR	N	2	0	Hour trap was run
RUN_MM	N	2	0	Minute trap was run
IN_CATCH	N	3	0	Number of fish caught in the inflow trap
OUT_CATCH	N	3	0	Number of fish caught in the outflow trap
POOLS	N	3	0	Estimated number of fish in pool
DOWN_CATCH	N	3	0	Number of fish caught in downstream facing trap
TRAP_SIZE	C	1	0	Trap size: S=small, L=large
CM5	N	5	2	Current velocity (m/s), 5 cm from shore, +-.015m/s
CM15	N	5	2	Flow (m/s), 15 cm from shore, +-.015 m/s
CM25	N	5	2	Flow (m/s) at 25 cm from shore, +-.015 m/s
CM35	N	5	2	Flow (m/s) at 35 cm from shore, +-.015 m/s
CM45	N	5	2	Flow (m/s) at 45 cm from shore, +-.015 m/s
CM55	N	5	2	Flow (m/s) at 55 cm from shore, +-.015 m/s
DRFT_CHECK	C	1	0	Drift sample designated as a check
COMMENTS	C	10	0	Comments
CHNGDATE	D	8	0	Date record was changed
CHNGTIME	N	4	0	Time record was changed

File: **FCHABUSE.DBF**
Contents: **Fish collections habitat use data, 1991-1993**

Field	Type	Size	Dec	Description
STUDY	N	5	0	AGFD study number
PAGE	N	4	0	Page of data sheets
BOTTOM	C	2	0	Bottom substrate code
DEPTH	N	4	0	Depth (cm)
FLOW	N	6	2	Current velocity (m/s), +-.01m/s
FEATURE	C	2	0	Cover feature code

File: ALLSONDE.DBF
Contents: Data from Hydrolab Datasondes

Field	Type	Size	Dec	Description
STUDY	N	5	0	Study number: trip and location numbers
SITE	N	3	0	Site number at that location
MONTH	N	2	0	Date
DAY	N	2	0	Date
YEAR	N	2	0	Date
HOUR	N	2	0	Time of day
MIN	N	2	0	Time of day
TEMP	N	5	2	Temperature (°C)
PH	N	4	2	pH
COND	N	5	3	Conductivity
SALINITY	N	3	1	Salinity
DOPERSAT	N	5	1	Dissolved oxygen (% Saturation)
DOMGPERL	N	5	2	Dissolved oxygen (mg/L)
REDOX	N	3	0	Redox potential
LEVEL	N	4	2	Depth of sonde
VOLTS	N	4	1	Battery strength

File: A_MASTER.DBF
Contents: Type A sample habitat data

Field	Type	Size	Dec	Description
STUDY	N	5	0	Study number: trip and location numbers
BY	C	3	0	Initials of data recorder
SITE	N	2	0	Site number at that location
HAB_CD	C	2	0	Habitat code
DEPTH	N	3	0	Depth
VELOCITY	N	3	0	Water velocity (cm/s)
TEMP	N	4	1	Temperature
SUBST_CD	C	2	0	Substrate code
TURB	N	6	0	Turbidity (NTU)
DO_PCNT	N	5	1	Dissolved oxygen (% saturation)
DO_MGL	N	5	2	Dissolved oxygen (mg/L)
COND	N	4	0	Conductivity (microsiemens)
AMB_LITE	C	2	0	Ambient light
PH	N	5	2	pH
GEAR_CD	C	2	0	Gear code
HAULS	N	2	0	Number of hauls taken with that gear
EFFORT	N	7	2	Effort (m2 for seines or hours for traps)
STATUS	C	1	0	dBase information
CHG_DATE	D	8	0	dBase information
CHG_TIME	C	8	0	dBase information
VERSION	N	2	0	dBase information

File: **BENTMAST.DBF**
Contents: **Benthos data**

Field	Type	Size	Dec	Description
TRIP_NO	N	2	0	Trip number
PAGE	N	3	0	Page number of data sheet
OFPAGE	N	3	0	Total number of pages
STUDY	N	5	0	Study number: trip and location numbers
SITE	C	5	0	Site number at that location
TAXA	C	9	0	Taxa of organism
NUMBER	N	5	0	Number of that taxa counted
CRUC_NO	N	3	0	Crucible number
CRUC_WGHT	N	8	4	Crucible weight
DRY_WEIGHT	N	8	4	Dry weight of organisms
ASH_WEIGHT	N	8	4	ash weight of organisms

File: **DIET_ANA.DBF**
Contents: **Fish diet analysis (stomach samples)**

Field	Type	Size	Dec	Description
STUDY	C	5	0	Study number: trip and location numbers
HAB_CD	C	2	0	Habitat code
SPECIES	C	3	0	Fish species
LENGTH	N	3	0	Total length
TAXA	C	3	0	Taxa of food organism
LIFE_STAGE	C	1	0	Life stage of food organism
NUMBER	N	4	0	Number of food organism counted
PARASITE	C	1	0	Parasitic: Y or N
NOTES	C	30	0	Descriptive notes

File: **FISH_ALL.DBF**
Contents: **Fish capture data**

Field	Type	Size	Dec	Description
STUDY	N	5	0	Study number: trip and location numbers
SITE	N	3	0	Site number at that location
HAB_CD	C	2	0	Habitat code
HAUL_NO	N	3	0	Haul number
SPECIES	C	3	0	Fish species
LENGTH	N	4	0	Total length
WEIGHT	N	4	0	Weight
NO_COLL	N	3	0	Number collected
SEX	C	1	0	Sex
MATURITY	N	1	0	Maturity code
TAG	C	10	0	Type of mark or tag number (if marked or tagged)
MARK_RECAP	C	1	0	Mark or recapture (if tagged)
DISP	C	2	0	Disposition
STATUS	C	1	0	dBase information
CHG_DATE	D	8	0	dBase information
CHG_TIME	C	8	0	dBase information
VERSION	N	2	0	dBase information

File: **MAP.DBF**
Contents: **Plane table mapping data**

Field	Type	Size	Dec	Description
STUDY	N	5	0	Study number: trip and location numbers
NUMBR_SITE	C	3	0	Site number and habitat code
BM_H20	N	3	0	Benchmark to water elevation
DEEP_PT	N	3	0	Maximum depth
TOT_PERIM	N	6	1	Total perimeter length
NET_LNGTH	N	5	1	Width of backwater at net location
AREA_TOT	N	6	1	Total area
AREA_25	N	6	1	Area < 25 cm deep
AREA_25_50	N	6	1	Area > 25 cm and < 50 cm deep
AREA_50_1	N	6	1	Area > 50 cm and < 100 cm deep
AREA_10_15	N	6	1	Area > 100 cm and < 150 cm deep
AREA_15	N	6	1	Area > 15 cm deep
SILT	N	6	1	Area with predominantly silt substrate
SAND	N	6	1	Area with predominantly sand substrate
GRAVEL	N	6	1	Area with predominantly gravel substrate
PEBBLE	N	6	1	Area with predominantly pebble substrate
COBBLE	N	6	1	Area with predominatly cobble substrate
BOULDER_LD	N	6	1	Area with boulder or ledge substrate
TERR_VEG	N	6	1	Area with terrestrial vegetation
RT_AQ_VEG	N	6	1	Area with rooted aquatic vegetation

File: MAST_ALL.DBF
Contents: Master data sheet data

Field	Type	Size	Dec	Description
STUDY	N	5	0	Study number: trip and location numbers
SITES	N	3	0	Site number at that location
MILE	N	6	2	River mile: distance from Lee's Ferry
SIDE	C	1	0	Side of the river (L or R) when facing downstream
REACH	N	3	0	Reach number
MST_MO	N	2	0	Month
MST_DA	N	2	0	Day
MST_YR	N	2	0	Year
MST_HR	N	2	0	Hour
MST_MM	N	2	0	Minute
FLOWCD	C	2	0	Flow code
FLOW	N	5	0	Estimated flow (cfs)
TYPE_A	N	2	0	Type A sample taken
TYPE_B	N	2	0	Type B sample taken
ANGLING	N	2	0	Angling sample taken
OPPORTUN	N	2	0	Opportunistic sample taken
SONDE	N	2	0	DataSonde set
BENTHOS	N	2	0	Benthos sample taken
SEDIMENT	N	2	0	Sediment sample taken
CHLOROPYLL	N	2	0	Chlorophyll sample taken
PLANKTON	N	2	0	Plankton sample taken
MAP_TOTAL	N	2	0	Total station map drawn
MAP_PLANE	N	2	0	Plane table map drawn
VISCERA	N	2	0	Viscera sample taken
DRIFT	N	2	0	Drift sample taken
TYPE_A2ND	N	2	0	Type A secondary sample taken
FISHCOLL	N	4	0	Total number of fish collected
STATUS	C	1	0	dbase information
CHG_DATE	D	8	0	dbase information
CHG_TIME	C	8	0	dbase information
VERSION	N	2	0	dbase information

File: **OPP_ALL.DBF**
Contents: **Opportunistic sampling data**

Field	Type	Size	Dec	Description
STUDY	N	5	0	Study number: trip and location numbers
BY	C	3	0	Initital of data recorder
SITE	N	2	0	Site number at that location
HAB_CD	C	2	0	Habitat code
DEPTH	N	3	0	Depth (cm)
VELOCITY	N	3	0	Water veleocity (cm/s)
TEMP	N	4	1	Temperature (■C)
SUBST_CD	C	2	0	Substrate code
TURB	N	6	0	Turbidity (NTU)
DO_PCNT	N	6	2	Dissolved oxygen (% saturation)
DO_MGL	N	5	2	Dissolved oxygen (mg/L)
COND	N	4	0	Conductivity (microsiemen)
AMB_LITE	C	2	0	Ambient light
GEAR_CD	C	2	0	Gear code
LENGTH	N	3	0	Length of net
HEIGHT	N	4	1	Height of net
MESH	N	7	5	Mesh size of net
EFFORT	N	7	2	Effort (m2 for seines or hours for traps)
SET_TIME	N	4	0	Trap set time
END_TIME	N	4	0	Trap check time
DISTANCE	N	5	0	Distance upstream from mainstem (tributaries only)
SITE_L	N	6	2	Site length
SITE_W	N	6	2	Mean site width
SITE_D	N	6	2	Mean site depth
PH	N	5	2	pH
STATUS	C	1	0	dbase information
CHG_DATE	D	8	0	dbase information
CHG_TIME	C	8	0	dbase information
VERSION	N	2	0	dbase information

File: **PLANKTON.DBF**
Contents: **Plankton data**

Field	Type	Size	Dec	Description
STUDY	N	5	0	Study number: trip and location numbers
HAB_CD	C	3	0	Habitat code
SUBSAMPLE	N	1	0	Subsample number
MAG	N	3	0	Microscope magnification used
ROW	N	1	0	Row number on counting slide
TAXA	C	3	0	Taxa of plankton organism
TOTAL	N	3	0	Total number counted of that taxa

File: **PRB3.DBF**
Contents: **Type B sample habitat data**

Field	Type	Size	Dec	Description
STUDY	N	5	0	Study number: trip and location numbers
SITE	N	3	0	Site number at that location
TRAP_NUM	N	2	0	Minnow trap number
CHK_MO	N	2	0	Month
CHK_DA	N	2	0	Day
CHK_YR	N	2	0	Year
CHK_HR	N	2	0	Hour
CHK_MM	N	2	0	Minute
HAB_CD	C	2	0	Habitat code at time of trap check
SUBST_CD	C	2	0	Substrate code
TEMP	N	5	2	Temperature
FLOW_CD	C	2	0	Flow code
FLOW_CFS	N	5	0	Estimate flow (cfs)
DEPTH	N	3	0	Depth (cm)
VELOCITY	N	4	2	Water velocity (cm/s)
NUM_FISH	N	3	0	Number of fish caught

File: **SEDIMENT.DBF**
Contents: **Sediment data**

Field	Type	Size	Dec	Description
STUDY	N	5	0	Study number: trip and location numbers
HABITAT	C	3	0	Habitat code and site number
HAB_CD	C	2	0	Habitat code
CRU_WT	N	9	4	Crucible weight
DRY_WT	N	9	4	Dry weight of sediments
ASH_WT	N	9	4	Ash weight of sediments
PET_WT	N	9	4	Petri dish weight
PET_65	N	9	4	Weight of sediments > 65 μm

Relational Links

The following lists the files that can be linked together and the fields used to link them.

Little Colorado River Native Fish Studies

File 1	File 2	Linking Fields
ALGEMAS1	ALGAECOL	METER, SET_MO, SET_DA, SET_YR, SET_HR, SET_MM, SAMP_NO
ALGEMAS1	HABITAT	METER, SET_MO, SET_DA, SET_YR, SET_HR, SET_MM, CELL_NO
QBENTHOS	ALGAECOL	SET_MO, SET_DA, SET_YR, SET_HR, SET_MM, MILE, SIDE
BEHAVIOR	MAS1FC93	MILE, SIDE, RUN_MO, RUN_DA, RUN_YR, RUN_HR, RUN_MM
BEHAVIOR	MASTFC92	MILE, SIDE, RUN_MO, RUN_DA, RUN_YR, RUN_HR, RUN_MM
BEHAVIOR	MASTFC91	MILE, SIDE, RUN_MO, RUN_DA, RUN_YR, RUN_HR, RUN_MM
DRFTMAST	DRIFTBIO	MILE, SET_MO, SET_DA, SET_YR, SET_HR, SET_MM, NUMBER
HABITAT	MASTFC91	RUN_MO, RUN_DA, RUN_YR, RUN_HR, RUN_MM, METER, SIDE
HABITAT	MASTFC92	RUN_MO, RUN_DA, RUN_YR, RUN_HR, RUN_MM, METER, SIDE
HABITAT	MAS1FC93	RUN_MO, RUN_DA, RUN_YR, RUN_HR, RUN_MM, METER, SIDE
HABITAT	HABPHOTO	RUN_MO, RUN_DA, RUN_YR, RUN_HR, RUN_MM, METER, SIDE
HABITAT	HABZOOPL	RUN_MO, RUN_DA, RUN_YR, RUN_HR, RUN_MM, METER, SIDE
AVAILABL	HABUSE	RUN_MO, RUN_DA, RUN_YR, MILE, SIDE
AVAILABL	LARVPRES	RUN_MO, RUN_DA, RUN_YR, MILE, SIDE
HABUSE	MASTFC92	MILE, SIDE, RUN_MO, RUN_DA, RUN_YR, PRESERVE
HABUSE	MAS1FC93	MILE, SIDE, RUN_MO, RUN_DA, RUN_YR, PRESERVE
LARVPRES	MASTFC92	RUN_MO, RUN_DA, RUN_YR, SIDE, HM
PRES193	AVAILABL	RUN_MO, RUN_DA, RUN_YR, MILE, SIDE
MAS1FC93	MOVEMAS1	RUN_MO, RUN_DA, RUN_YR, RUN_HR, RUN_MM, MILE, SIDE
MAS1FC93	VISCMAST	RUN_MO, RUN_DA, RUN_YR, MILE, SIDE, STOM_NUM
MASTFC92	VISCMAST	RUN_MO, RUN_DA, RUN_YR, MILE, SIDE, STOM_NUM
MASTFC91	VISCMAST	RUN_MO, RUN_DA, RUN_YR, MILE, SIDE, STOM_NUM
MASTERFC	MOVEMAS1	RUN_MO, RUN_DA, RUN_YR, RUN_HR, RUN_MM, MILE, SIDE
MASTERFC	VISCMAST	RUN_MO, RUN_DA, RUN_YR, MILE, SIDE, STOM_NUM
FCHABUSE	MASTFC91	STUDY, PAGE
FCHABUSE	MASTFC92	STUDY, PAGE
FCHABUSE	MAS1FC93	STUDY, PAGE
FCHABUSE	MASTERFC	STUDY, PAGE

Mainstem Colorado River Native Fish Studies

All files contain a STUDY field which can be used to relationally link any set of files. Other fields that can be used as relational links include SITE, HAB_CD, and SPECIES.

ARIZONA STATE UNIVERSITY

File Structures

File: **ASU9X**
Contents: **Fish collection data**

Field	Type	Size	Dec	Description
CAMP	C	1		Camp code
TRIP	N	2		Trip number
YEARCODE	C	1		Year code
WACODE	N	2		AGFD reach code: 22=Little Colorado River
LOCATION	C	8		USFWS transect code and/or generic site name
GEAR	N	1		Gear code
MONTH	N	2		Date
DAY	N	2		Date
YEAR	N	2		Date
?	N	6	2	This field was included in the sample data set, but not in the description of data fields.
METERS	N	7	1	Meters above the mouth
HOUR	N	4		Time
SPECIES	C	3		Fish species
LENGTH	N	4		Total length
WEIGHT	N	4		Weight
SEX	N	1		Sex code
MATURITY	N	1		Maturity code
TAG	C	10		Tag number
RECAPTURE	C	10		Tag number of recaptured fish

Relational Links

ASU's data are stored in a single flat file, divided only by calendar year, so no links are necessary. Since the three files have the same structure, they can be combined by simply appending one file to another.

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File Structures

The information on these file structures was extracted from Gorman (1993). The file names were assigned by BIO/WEST since the actual file names were not provided.

File: **FWS-HOOP.DBF**
Contents: **ASU hoop nets and FWS mini-hoop nets**

Field	Type	Size	Dec	Description
GEAR	C	3		Gear code
GEARD	N	5		Gear description
ID	N	8		LCR transect and bank location coding
DATE	D	8		Date when measured
TIME	N	4		Time when measured
SETD	D	8		Date set
SETT	N	4		Time set
PULD	D	8		Date pulled
PULT	N	4		Time pulled
LATDS	N	4		Lateral distance to set
UPDN	N	4		Distance up or downstream of transect
LATP	N	4		Lateral distance to nearest bank or edge
MO	N	3		Depth of water at mouth of hoop
MTH	N	3		Distance below water surface to top of hoop (mouth)
PO	N	3		Depth of water at point of net
PTH	N	3		Distance below water surface to top of front hoop
T	C	1		Transect letter for hoop net habitat meas. grid
P	N	1		Point or column number for hoop net hab. meas. grid
EDG	N	3		Distance (cm) when <=100 to edge
DPH	N	3		Depth (cm)
CUR	N	1		Current category
CC	C	2		Current comments
SUB	N	2		Primary substrate
SBC	C	6		Secondary substrate descriptor
OVH	C	5		Overhang, vert. edge
CVR	N	2		Cover
CCV	N	2		Corrected cover

File: **FWS-TRAN.DBF**
Contents: **FWS transect data**

Field	Type	Size	Dec	Description
KM	N	6	3	Distance in km from Zero Rock (confluence)
M	N	1		Indicates 100 transect or other
ID	C	8		LCR transect ID
GEAR	C	3		Always TRN
DATE	D	8		Date transect measured
TIME	N	4		Time transect measured
PT	N	3		Habitat point number
ELV	N	3		Change in elevation of water surface between transects
LATP	N	4		Lateral distance to nearest stream bank
EDG	N	3		Distance (cm) when <=100 to edge
DPH	N	4		Depth (cm)
CUR	N	1		Current category
CC	C	2		Current comments
SUB	N	2		Primary substrate
SBC	C	6		Secondary substrate descriptor
OVH	C	5		Overhang, vert. edge
CVR	N	2		Cover
CCV	N	2		Corrected cover

File: **FWS-TRAP.DBF**
Contents: **FWS minnow trap data**

Field	Type	Size	Dec	Description
ID	C	8		LCR transect ID, trap number, and bank position arrow
DATE	D	8		Date when measured
TIME	N	4		Time when measured
GEAR	C	3		Always MTP
SETD	D	8		Date set
SETT	N	4		Time set
PULD	D	8		Date pulled
PULT	N	4		Time pulled
LATP	N	4		Distance from closest bank to middle of trap
UPDN	N	4		Distance up or downstream of transect line
POS	N	3		Depth to top of trap
EDG	N	3		Distance (cm) when <=100 to edge
DPH	N	4		Depth (cm)
CUR	N	1		Current category
CC	C	2		Current comments
SUB	N	2		Primary substrate
SBC	C	6		Secondary substrate descriptor
OVH	C	5		Overhang, vert. edge
CVR	N	2		Cover
CCV	N	2		Corrected cover

File: **FWS-SEIN.DBF**
Contents: **FWS seine data**

Field	Type	Size	Dec	Description
ID	C	8		LCR transect ID followed by bank position arrow
DATE	D	8		Date when measured
TIME	N	4		Time when measured
GEAR	C	3		Always SEN
SNSZ	C	7		Seine dimensions, length X width in cm
MESH	N	2		Mesh size, hundredths of inches
L	N	4		Length (cm) of area seined
W	N	4		Width (cm) of area seined
AREA	N	3		Area seined (square meters)
SWPS	N	1		Number of sweeps at a sample site
DBT	N	3		Distance between transects
DBP	N	3		Distance between points
LATDS	N	4		Lateral distance (cm) from nearest bank to first point
T	C	1		Transect or column
PT	N	2		Point or row
EDG	N	3		Distance (cm) when <=100 to edge
DPH	N	4		Depth (cm)
CUR	N	1		Current category
CC	C	2		Current comments
SUB	N	2		Primary substrate
SBC	C	6		Secondary substrate descriptor
OVH	C	5		Overhang, vert. edge
CVR	N	2		Cover
CCV	N	2		Corrected cover

File: **FWS-FISH.DBF**
Contents: **FWS fish capture data**

Field	Type	Size	Dec	Description
DATE	D	8		Date fish was measured
TIME	N	4		Time fish was measured
PER	C	1		Period of day fish was measured
ID	C	8		LCR transect, bank location, trap/net number
GEAR	C	3		Gear code
SPP	C	3		Fish species
NUM	N	3		Number of fish
LNTH	N	3		Length of fish (mm)
WGHT	N	4		Weight of fish (g)
SEX	C	1		Sex
FIN	C	4		Fin clip code for new captures and recaps
PIT	C	10		PIT tag number
RECAP	C	1		Recapture or new capture
REMARKS	C	20		Remarks

File: **FWS-WQ.DBF**
Contents: **FWS water quality data**

Field	Type	Size	Dec	Description
GEAR	C	4		Water quality instrumentation
CAMP	C	1		Camp
KM	N	6	3	Kilometers
DATE	D	8		Date measured
TIME	N	4		Time measured
DHI	N	3		Daily high air temperature (F)
DLO	N	3		Daily low air temperature (F)
AMBT	N	3		Present ambient air temperature (F)
TEMP	N	3		Water temperature (C)
COND	N	4		Conductivity (mS)
PH	N	4		pH
DO	N	4		Dissolved oxygen (ppm)
ORP	N	4		Oxidation/reduction potential (hydrolab only)
SAL	N	3		Salinity (percent)
SECCHI	N	3		Secchi depth (cm)
TURBID	N	6		Turbidity (NTUs)
RELEV	N	3		Depth of river above base flow (cm)
GAUGE	N	3		Reading on staff gauge
CELEV	N	3		Corrected river elevation

Relational Links

We do not have this information at this time.

File Structures

The files of the same name for both the humpback chub and Hualapai studies have the same structures.

File: **CHUB.DBF**
Contents: **Humpback chub morphometrics and meristics, Oct 1990-Nov1993**

Field	Type	Size	Dec	Description
PIT_TAG	C	10		PIT tag number
DATE	C	6		Date
RIVER	C	2		River or tributary code
METER	N	4		Meters above tributary mouth
TYPE	C	1		Type of sample
GEAR	C	2		Gear code
SAMPLE_NUM	C	3		Sample number
TRIP	C	5		Trip code
REACH	C	1		Mainstem Colorado River reach code
CLIPBOARD	C	1		Clipboard number
TL	N	3		Total length
FL	N	3		Fork length
SL	N	3		Standard length
WT	N	4		Weight (grams)
SEX	C	1		Sex code
RIPE	C	3		Gonadal maturity code
P1_P2	N	4	1	Distance between insertions of pectoral and pelvic fins
ND	N	4	1	Nuchal depression depth
CPL	N	5	1	Caudal peduncle length
CPMAXD	N	4	1	Caudal peduncle depth (maximum)
CPMIND	N	4	1	Caudal peduncle depth (minimum)
HEAD_LN	N	4	1	Head length
SNOUT_LN	N	4	1	Snout length
DORSAL_FB	N	4	1	Dorsal fin base
ANAL_FB	N	4	1	Anal fin base
BODY_DEPTH	N	5	1	Body depth
DORSAL_RAY	N	2		Number of dorsal fin rays
ANAL_RAY	N	2		Number of anal fin rays
RECAPTURE	C	1		Recaptured fish
OLD_TAG	C	10		Old tag number if fish is recapture
DISP	C	2		Disposition code
CAMERA_NUM	C	2		Camera number
ROLL_NUM	C	2		Roll number
FRAME_NUM	C	5		Frame numbers
VIDEO_NUM	C	2		Video number
RM_CAPTURE	N	6	2	River mile of capture location
RM_RELEASE	N	6	2	River mile of release location
RADIO	C	1		Radio-tagged fish
COMMENTS	C	60		Comments

File: **NETTING.DBF**
Contents: **Netting and trapping sample data, Oct 1990-Nov 1993 (humpback chub)**
Netting and trapping sample data, May 1992-Dec 1994 (Hualapai)

Field	Type	Size	Dec	Description
TYPE	C	1		Type of sample
TRIP	C	5		Trip code
REACH	C	1		Mainstem Colorado River reach code
CLIPBOARD	C	1		Clipboard number
DATE	C	6		Date
RIVER	C	2		River or tributary code
RM	N	6	2	River mile
METER	N	4		Meters above tributary mouth
GEAR	C	2		Gear code
HAB1	C	2		General habitat
HAB2	C	2		Specific habitat
HAB3	C	2		Shoreline habitat
SIDE	C	1		Side of river looking downstream
PROFILE	C	1		Cross-section fathometer profile status
MAX_DEPTH	N	4	1	Maximum depth at gear location
SUB1	C	2		Dominant substrate
SUB2	C	2		Secondary substrate
FISH_PRES	C	1		Fish or other materials preserved
NO_BOTTLES	N	1		Number of bottles with preserved materials
CAMERA_NUM	C	2		Camera number
PHOTO_ROLL	C	2		Roll number
FRAME_NUM	C	5		Frame numbers
CREW	C	8		Initials of crew members
SINGLE	C	1		Marks one of multiple records for a sample
SAMPLE_NUM	C	3		Sample number
TIME_SET	N	4		Net set time
TIME_PULL	N	4		Net pull time
END_DATE	C	6		Net pull date
TIME_ELAPS	N	5	2	Elapsed time
LIGHT	C	2		Ambient light
WEATHER	C	2		Weather
TURBIDITY	C	2		Turbidity
TEMP_AIR	N	4	1	Air temperature
TEMP_MC	N	4	1	Main channel temperature
TEMP_HAB	N	4	1	Habitat temperature
FLUCT	C	2		River stage change
SPECIES	C	2		Fish species code
YOY	N	4		Number of young-of-year fish
JUV	N	4		Number of juvenile fish
ADU	N	4		Number of adult fish
TOTAL	N	4		Total number of fish
COMMENTS	C	0		Comments
MAP_ID_NUM	C	4		Unique net location ID to link with GIS

File: **ELECTRO.DBF**
Contents: **Electrofishing sample data, Oct 1990-Nov 1993 (humpback chub)**
Electrofishing sample data, May 1992-Dec 1994 (Hualapai)

Field	Type	Size	Dec	Description
TYPE	C	1		Type of sample
SAMPLE_NUM	C	3		Sample number
TRIP	C	5		Trip code
REACH	C	1		Mainstem Colorado River reach code
CLIPBOARD	C	1		Clipboard
DATE	C	6		Date
RIVER	C	2		River or tributary code
START_RM	N	6	2	River mile at start of sample
END_RM	N	6	2	River mile at end of sample
METER	N	4		Meters above tributary mouth
TIME_START	N	4		Sample start time
TIME_END	N	4		Sample end time
SECONDS	N	5		Seconds electrofished
VOLTS	N	3		Voltage setting
AMPS	N	4	1	Amperage level
LIGHT	C	2		Ambient light
HAB1	C	2		General habitat
HAB2	C	2		Specific habitat
HAB3	C	2		Shoreline habitat
SUB1	C	2		Dominant substrate
SUB2	C	2		Secondary substrate
TEMP_AIR	N	4	1	Air temperature
TEMP_MC	N	4	1	Main channel temperature
TEMP_HAB	N	4	1	Habitat temperature
TURBIDITY	C	2		Turbidity
WEATHER	C	2		Weather
FLUCT	C	2		River stage change
FISH_PRES	C	1		Fish or other materials preserved
NO_BOTTLES	N	1		Number of bottles of preserved materials
CAMERA_NUM	C	2		Camera number
PHOTO_ROLL	C	2		Roll number
FRAME_NUM	C	5		Frame number
CREW	C	8		Initials of crew members
SINGLE	C	1		Marks one of multiple records for a sample
SPECIES	C	2		Fish species code
YOY	N	4		Number of young-of-year fish
JUV	N	4		Number of juvenile fish
ADU	N	4		Number of adult fish
TOTAL	N	4		Total number of fish
COMMENTS	C	60		Comments

File: **SEINE.DBF**
Contents: **Seining sample data, Oct 1990-Nov 1993 (humpback chub)**
Seining sample data, May 1992-Dec 1994 (Hualapai)

Field	Type	Size	Dec	Description
TYPE	C	1		Type of sample
SAMPLE_NUM	C	3		Sample number
TRIP	C	5		Trip code
REACH	C	1		Mainstem Colorado River reach code
CLIPBOARD	C	1		Clipboard number
DATE	C	6		Date
RIVER	C	2		River or tributary code
RM	N	7	2	River mile
METER	N	4		Meters above tributary mouth
GEAR	C	2		Gear code
TIME_START	N	4		Sample start time
HAB1	C	2		General habitat
HAB2	C	2		Specific habitat
HAB3	C	2		Shoreline habitat
SUB1	C	2		Dominant substrate
SUB2	C	2		Secondary substrate
TEMP_AIR	N	4	1	Air temperature
TEMP_MC	N	4	1	Main channel temperature
TEMP_HAB	N	4	1	Habitat temperature
QUANT	C	1		Quantitative seine haul
SUBSAMPL	C	1		Subsampled habitat
LIGHT	C	2		Ambient light
WEATHER	C	2		Weather
TURBIDITY	C	2		Turbidity
FLUCT	C	2		River stage change
HABL	N	5	1	Habitat length
HABW	N	5	1	Habitat width
SAMP_LN	N	5	1	Sample length
SAMP_WID	N	5	1	Sample width
SAMP_AREA	N	7	2	Sample area
MAX_DEPTH	N	4	1	Maximum depth of habitat
DEPTH_1	N	4	1	Depth halfway between max and one side
DEPTH_2	N	4	1	Depth halfway between max and other side
FISH_PRES	C	1		Fish or other materials preserved
NO_BOTTLES	N	1		Number of bottles of preserved materials
CAMERA_NUM	C	2		Camera number
PHOTO_ROLL	C	2		Roll number
FRAME_NUM	C	5		Frame number
CREW	C	8		Initials of crew members
SINGLE	C	1		Marks one of multiple records for a sample
SPECIES	C	2		Fish species code
LAR	N	4		Number of larval fish
YOY	N	4		Number of young-of-year fish
JUV	N	4		Number of juvenile fish
ADU	N	4		Number of adult fish
TOTAL	N	4		Total number of fish
COMMENTS	C	60		Comments

File: **FISH.DBF**
Contents: **All fish capture data, Oct 1990-Nov 1993 (humpback chub)**
All fish capture data, May 1992-Dec 1994 (Hualapai)

Field	Type	Size	Dec	Description
TYPE	C	1		Type of sample
SAMPLE_NUM	C	3		Sample number
TRIP	C	5		Trip code
REACH	C	1		MainstemColorado River reach code
CLIPBOARD	C	1		Clipboard
DATE	C	6		Date
GEAR	C	2		Gear code
HAB1	C	2		General habitat
HAB2	C	2		Specific habitat
HAB3	C	2		Shoreline habitat
SUB1	C	2		Dominant substrate
SUB2	C	2		Secondary substrate
SPECIES	C	2		Fish species code
TL	N	3		Total length
SL	N	3		Standard length
LB	N	2		Pounds
OZ	N	2		Ounces
WT	N	4		Weight (grams)
PIT_TAG	C	10		PIT tag number
RECAPTURE	C	1		Recaptured fish
OLD_TAG	C	10		Old tag number if fish is recapture
PHOTO	C	1		Photographs taken
VIDEO	C	1		Video footage taken
SEX	C	1		Sex
RIPE	C	2		Gonadal maturity code
DISP	C	2		Disposition code
RIVER	C	2		River or tributary code
RM	N	6	2	River mile of capture location
METER	N	4		Meters above mouth of tributary
RM_RELEASEN	6	2		River mile of release location
COMMENTS	C	60		Comments

File: **SURVEIL.DBF**
Contents: **Radiotelemetry surveillance, Oct 1990-Nov 1992**

Field	Type	Size	Dec	Description
SAMPLE_NUMC	3			Sample number
TRIP_NUM	C	2		Trip code
REACH	C	1		Mainstem Colorado River reach code
CLIPBOARD	C	1		Clipboard number
SINGLE	C	1		Marks one of multiple records for a sample
MODE	C	2		Type of surveillance
START_DATE	N	6		Date at start of surveillance
START_TIME	N	4		Time at start of surveillance
END_DATE	N	6		Date at end of surveillance
END_TIME	N	4		Time at end of surveillance
TIME_ELAPS	N	6	2	Time elapsed during surveillance
START_RMI	N	5	1	Starting river mile of surveillance
END_RMI	N	5	1	Ending river mile of surveillance
LIGHT	C	2		Ambient light
WEATHER	C	2		Weather code
TURBIDITY	C	1		Turbidity code
SECHI_DISK	N	4	2	Secchi depth in meters
NTU	N	6	1	Turbidity in NTUs
FLUCT	C	2		River stage change during surveillance
CREW	C	8		Initials of crew members
DATE	N	6		Date of individual fish contact
TIME	N	4		Time of individual fish contact
RIVER	C	2		River or tributary code
RM	N	6	2	River mile
SIDE	C	1		Side of river looking downstream
FREQ	N	3		Tag frequency (40.XXX MHz)
PULSE	N	3		Tag pulse rate (pulses/minute)
CONFIDENCE	C	1		Observer confidence in location accuracy
HAB2	C	2		Specific habitat
COVER	C	2		Instream cover
PIT_TAG	C	10		PIT tag number
COMMENTS	C	75		Comments

File: **OBSERV_H.DBF**
Contents: **Header for radiotelemetry observations, Oct 1990-Nov 1992**

Field	Type	Size	Dec	Description
SAMPLE_NUMC	3			Sample number
TRIP_NUM	C	2		Trip code
REACH	C	1		Mainstem Colorado River reach code
CLIPBOARD	C	1		Clipboard number
SINGLE	C	1		Marks one of multiple records for a sample
START_DATE	N	6		Date at start of observation
START_TIME	N	4		Time at start of observation
END_DATE	N	6		Date at end of observation
END_TIME	N	4		Time at end of observation
TIME_ELAPSN	6	2		Time elapsed during observation
RIVER	C	2		River or tributary code
RM	N	6	2	River mile
MODE	C	2		Mode of observation
HAB_MAP_NO	C	10		Habitat map number
BENCHMARK	C	6		Temporary benchmark code
CONFIDENCE	N	1		Observer confidence in location accuracy
CAMERA_NUM	C	2		Camera number
PHOTO_ROLL	C	2		Roll number
FRAME_NUM	C	5		Frame numbers
CREW	C	8		Initials of crew members
PIT_TAG	C	10		PIT tag number
TL	N	3		Total length when implanted
WT	N	4		Weight when implanted
SEX	C	1		Sex
TAG_SIZE	N	2		Weight of tag in grams
FREQ_1	N	3		Original tag frequency
FREQ_2	N	3		Strongest tag frequency observed
PULSE_1	N	2		Original tag pulse rate
PULSE_2	N	2		Tag pulse rate during observation
SURGEON	C	2		Initials of surgeon

File: OBSERV_M.DBF
Contents: Movement for radiotelemetry observations, Oct 1990-Nov 1992

Field	Type	Size	Dec	Description
SAMPLE_NUM	C	3		Sample number
TRIP	C	5		Trip code
REACH	C	1		Mainstem Colorado River reach code
CLIPBOARD	C	1		Clipboard number
SINGLE	C	1		Marks one of multiple records for a sample
PIT_TAG	C	10		PIT tag number
START_DATE	N	6		Date at start of observation block
START_TIME	N	4		Time at start of observation block
START_RMI	N	6	2	River mile location at start of observation block
START_HAB	C	2		Specific habitat at start of observation block
START_GAGE	N	5	1	River stage at start of observation block
START_LITE	C	2		Ambient light at start of observation block
START_WEAT	C	2		Weather code at start of observation block
START_TURB	C	2		Turbidity code at start of observation block
END_DATE	N	6		Date at end of observation block
END_TIME	N	4		Time at end of observation block
END_RMI	N	6	2	River mile location at end of observation block
END_HAB	C	2		Specific habitat at end of observation block
MOVEMENT	N	3		Movement during observation block in meters
END_GAGE	N	5	1	River stage at end of observation block
END_LITE	C	2		Ambient light at end of observation block
END_WEAT	C	2		Weather code at end of observation block
END_TURB	C	2		Turbidity code at end of observation block
TIME_ELAPSN	6	2		Time elapsed during observation block
GAGE	N	6	1	River stage change during observation block in cm
STAGE_RATEN	7	2		Rate of river stage change in cm/hr

File: REMOTE.DBF
Contents: Remote radiotelemetry station data, Oct 1990-Nov 1993

Field	Type	Size	Dec	Description
JUL_DATE	N	3		Julian date
TIME	N	4		Time
FREQ	N	3		Tag frequency (40.XXX MHz)
PULSE	N	3		Tag pulse rate (pulses/minute)

File: **DRIFT.DBF**
Contents: **Drift net sample analysis data, Oct 1990-Nov 1993 (humpback chub)**
Drift net sample analysis data, May 1992-Dec 1994 (Hualapai)

Field	Type	Size	Dec	Description
DATE	N	6		Date of sample
TIME	N	4		Time of sample
RM	C	5		River mile
STAGE	C	2		River stage change
HAB	C	2		Habitat
DEPTH	C	3		Height of net above water surface, cm
SIMADU	N	7	2	Number of adult simuliids
SIMPUP	N	7	2	Number of pupa simuliids
SIMLAR	N	7	2	Number of larval simuliids
CHIRADU	N	7	2	Number of adult chironomids
CHIRPUP	N	7	2	Number of pupa chironomids
CHIRLAR	N	7	2	Number of larval chironomids
GAMMADU	N	7	2	Number of adult gammarus (>7mm)
GAMMIMM	N	7	2	Number of immature gammarus (<7mm)
OTHER	N	7	2	Number of other aquatic invertibrates
TERR	N	7	2	Number of terrestrial insects
CLADDRWT	N	7	4	Cladophora dry weight (grams)
CLADPER	N	2		Percent cladophora
LABVOL	N	3		Sample volume after preservation (ml)
FIELDVOL	N	3		Sample volume before preservation (ml)
REHYDVOL	N	3		Sample volume after rehydration in lab (ml)
CMH	N	7	2	Water filtered through net (Cubic meters per hour)
NOTES	C	100		Specific notes about sample

File: **FOOD.DBF**
Contents: **Stomach pumping analysis data, 1993**

Field	Type	Size	Dec	Description
TYPE	C	1		Type of sample
SAMPLE_NUM	C	3		Sample number
TRIP	C	5		Trip code
REACH	C	1		Mainstem Colorado River reach code
CLIPBOARD	C	1		Clipboard
DATE	N	6		Date of sample
RIVER	C	2		River or tributary code
RM	N	5	1	River mile
SPECIES	C	3		Species of fish stomach pumped
AGE	C	2		Age of fish (adult or juvenile)
SEX	C	1		Sex
TL	N	3		Total length
SL	N	3		Standard length
LB	N	3		Weight in pounds
OZ	N	3		Weight in ounces
WT	N	4		Weight in grams
PIT_TAG	C	10		PIT tag number
GAMMADU	N	3		Number of adult gammarus (>7mm)
GAMMIMM	N	3		Number of immature gammarus (<7mm)
SIMADU	N	3		Number of adult simuliids
SIMLARV	N	3		Number of larval sumuliids
SIMPUP	N	3		Number of pupa simuliids
CHIRADU	N	3		Number of adult chironomids
CHIRPUP	N	3		Number of pupa chironomids
CHIRLAR	N	3		Number of larval chironomids
ANNELID	N	3		Number of annelids
OTHER	N	3		Number of other aquatic insects
TERR	N	3		Number of terrestrial insects
CLADOVOL	N	3		Volume of cladophora (ml)
NEMOTODES	L	1		Presence of nematodes
TAPEWORMS	L	1		Presence of tapeworms
FISH	L	1		Presence of fish
MEMO	C	200		Details of sample

File: DATASOND.DBF
Contents: Datasonde water quality data, Oct 1990-Nov 1993 (humpback chub)
Datasonde water quality data, May 1992-Dec 1994 (Hualapai)

Field	Type	Size	Dec	Description
DATE	N	6		Date
TIME	N	4		Military time
RIVER	C	2		River or tributary code
RM	N	6	2	River mile
TEMP	N	5	2	Temperature, degrees C
PH	N	5	2	pH
COND	N	6	3	Conductivity
DO	N	5	2	Dissolved oxygen
BATT	N	5	2	Battery voltage

File: SURVEYOR.DBF
Contents: Surveyor II water quality data, Oct 1990-Nov 1993 (humpback chub)
Surveyor II water quality data, May 1992-Dec 1994 (Hualapai)

Field	Type	Size	Dec	Description
DATE	N	6		Date
TIME	N	4		Military time
RIVER	C	2		River or tributary code
RM	N	6	2	River mile
TEMP	N	5	2	Temperature, degrees C
PH	N	5	2	pH
TRUEDO	N	5	2	Dissolved oxygen
COND	N	6	3	Conductivity
ORP	N	6	3	Oxidation-reduction potential
BATT	N	5	2	Battery voltage

File: **JUVHAB.DBF**
Contents: **Juvenile habitat measurements, Oct 1990-Nov 1993**

Field	Type	Size	Dec	Description
SAMPLE_NUMC	3			Sample number
TRIP	C	5		Trip code
REACH	C	1		Mainstem Colorado River reach code
DATE	N	6		Date
RIVER	C	2		River or tributary code
RM	N	5	2	River mile
SIDE	C	1		Side of river looking downstream
TBM	C	8		Temporary benchmark location code
GAGE_BEG	N	4		River stage at beginning of sample
GAGE_END	N	4		River stage at end of sample
TIME_BEG	N	4		Time at start of sample
TIME_END	N	4		Time at end of sample
LC_MC_FLOW	N	5		Approximate discharge in cfs
SHORETYPE	C	15		Shoreline type
CREW	C	8		Initials of crew members
FISHPRESNT	C	1		Fish present
COMMENTS	C	20		Comments
TRAN_NUM	N	2		Transect number
DIST_05_DP	N	5	2	Depth 0.5 meters from shore
DIST_05_VL	N	5	2	Velocity at 0.6 depth, 0.5 meters from shore
DIST_05_S1	C	2		Dominant substrate 0.5 meters from shore
DIST_05_S2	C	2		Secondary substrate 0.5 meters from shore
DIST_10_DP	N	5	2	Depth 1.0 meter from shore
DIST_10_VL	N	5	2	Velocity at 0.6 depth, 1.0 meter from shore
DIST_10_S1	C	2		Dominant substrate 1.0 meter from shore
DIST_10_S2	C	2		Secondary substrate 1.0 meter from shore
DIST_15_DP	N	5	2	Depth 1.5 meters from shore
DIST_15_VL	N	5	2	Velocity at 0.6 depth, 1.5 meters from shore
DIST_15_S1	C	2		Dominant substrate 1.5 meters from shore
DIST_15_S2	C	2		Secondary substrate 1.5 meters from shore
DIST_25_DP	N	5	2	Depth 2.5 meters from shore
DIST_25_VL	N	5	2	Velocity at 0.6 depth, 2.5 meters from shore
DIST_25_S1	C	2		Dominant substrate 2.5 meters from shore
DIST_25_S2	C	2		Secondary substrate 2.5 meters from shore

File: **SCALES.DBF**
Contents: **Humpback chub scale analysis, Oct 1990-Nov 1993**

Field	Type	Size	Dec	Description
BOX	C	2		Box number of slide location
FISH_NO	C	2		Sequential fish number
SINGLE	C	1		Marks one of multiple scales per fish
SAMPLE_NO	C	8		Unique sample identifier
DATE	N	6		Date
SPECIES	C	2		Fish species code
RIVER_MILEN	6	2		Mainstem river mile or tributary meters
TL	N	3		Total length
SL	N	3		Standard length
SCALE_RAD	N	4	1	Length from nucleus to scale margin
NO_CIRC	N	2		Total number of circuli
A1	N	4	1	First annulus from nucleus
NO_CIRC_A1	N	2		Number of circuli to first annulus
A2	N	4	1	Second annulus from nucleus
NO_CIRC_A2	N	2		Number of circuli to second annulus
A3	N	4	1	Third annulus from nucleus
NO_CIRC_A3	N	2		Number of circuli to third annulus
A4	N	4	1	Fourth annulus from nucleus
NO_CIRC_A4	N	2		Number of circuli to fourth annulus
A5	N	4	1	Fifth annulus from nucleus
NO_CIRC_A5	N	2		Number of circuli to fifth annulus
A6	N	4	1	Sixth annulus from nucleus
NO_CIRC_A6	N	2		Number of circuli to sixth annulus
X	N	4	1	Length from nucleus to transitional check
NO_CIRC_X	N	2		Number of circuli to transitional check
AGE	N	1		Age of fish when scale collected
YEAR_CLASS	N	4		Year fish was hatched
RELIABLE	C	1		Reliability of scale information
PCX	N	5	2	Proportional total length at trans. check
BCX	N	5	2	Back-calculated total length at trans. check
BC1	N	5	2	Back-calculated total length at first annulus
PC1	N	5	2	Proportional total length at first annulus
BC2	N	5	2	Back-calculated total length at second annulus
BC3	N	5	2	Back-calculated total length at third annulus
BC4	N	5	2	Back-calculated total length at fourth annulus
BC5	N	5	2	Back-calculated total length at fifth annulus
BC6	N	5	2	Back-calculated total length at sixth annulus

Relational Links

The following lists the files that can be linked together and the fields used to link them. For ease of linking and some analyses, the five fields that constitute a unique sample identifier were combined into a single field called KEY.

File 1	File 2	Linking Fields
NETTING	CHUB	KEY (TYPE+TRIP+SAMPLE_NUM+REACH+CLIPBOARD)
NETTING	FISH	KEY (TYPE+TRIP+SAMPLE_NUM+REACH+CLIPBOARD)
ELECTRO	CHUB	KEY (TYPE+TRIP+SAMPLE_NUM+REACH+CLIPBOARD)
ELECTRO	FISH	KEY (TYPE+TRIP+SAMPLE_NUM+REACH+CLIPBOARD)
SEINE	CHUB	KEY (TYPE+TRIP+SAMPLE_NUM+REACH+CLIPBOARD)
SEINE	FISH	KEY (TYPE+TRIP+SAMPLE_NUM+REACH+CLIPBOARD)
OBSERV_H	OBSERV_M	TRIP_NUM, SAMPLE_NUM
NETTING	Sample	MAP_ID_NUM
	Location	
	Maps	

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File Structure

We do not have this information at this time.

Relational Links

We do not have this information at this time.

HISTORICAL COLLECTIONS

The following structures were described by Kubly (1990). We do not have descriptions of what is in each field at this time.

File Structures

File: **MNACATCH.DBF**
Contents: **Carothers et al. catch file**

Field	Type	Size	Dec	Description
WACODE	N	4		
WATER	C	5		
GEAR	N	1		
DATE	N	6		
EFFORT	N	5		
STATION	C	5		
TIME	N	4		
SPECIES	C	3		
LENGTH	N	5		
WEIGHT	N	5		
SEX	C	1		
MAT	N	1		
TAGNO	N	10		
RECAPNO	N	10		

File: **LKRARE.DBF**
Contents: **Kaeding and Zimmerman rare file**

Field	Type	Size	Dec	Description
RIVER	C	2		
STRATUM	C	1		
RIVERMILE	N	4	1	
TYPE	C	1		
DATE	C	6		
START	N	4		
STOP	N	4		
GEAR	C	2		
HAB_1	C	2		
HAB_2	C	2		
DEPTH	N	4	1	
VELOCITY	N	3	1	
SUBSTR_1	C	2		
SUBSTR_2	C	2		
SPECIES	C	2		
SEX	C	1		
TL_MM	N	5		
WT_G	N	5	1	
DORSFIN	N	2		
ANALFIN	N	2		
P1_P2	N	3	1	
D	N	3	1	
TAGNO	C	5		
COLOR	C	1		
RECAP	C	1		
LERNAEA	N	8		
DEPOSITIONC	2			
AGECLASS	C	2		

File: LKPHYS.DBF
Contents: Kaeding and Zimmerman physical file

Field	Type	Size	Dec	Description
RIVER	C	2		
STRATUM	C	1		
RIVERMILE	N	3	1	
DATE	N	6		
TIME	N	4		
H2OTEMP_C	N	3	1	
AIRTEMP_C	N	2		
DO_PPM	N	2		
CONDUCT	N	4		
SALIN	N	2	1	
TURB	N	2		
PH	N	2	1	
WIDTH_1	N	3		
MAXD_1	N	3	1	
MEAND_1	N	3	1	
S2D_1	N	4	1	
WIDTH_2	N	3		
MAXD_2	N	3	1	
MEAND_2	N	3	1	
S2D_2	N	4	1	
WIDTH_3	N	3		
MAXD_3	N	3	1	
MEAND_3	N	3	1	
S2D_3	N	4	1	

File: LKCATCH.DBF
Contents: Kaeding and Zimmerman catch file

Field	Type	Size	Dec	Description
STRATUM	N	1		
RIVERMILE	N	4	1	
TYPE	C	1		
DATE	N	6		
START	N	4		
STOP	N	4		
GEAR	C	2		
HAB_1	C	2		
HAB_2	C	2		
AREA	N	4		
DEPTH	N	4	1	
VELOCITY	N	3	1	
SUBSTR_1	C	2		
SUBSTR_2	C	2		
SPECIES	C	2		
YOY	N	4		
JUV	N	3		
ADU	N	3		

File: AGFDLARV.DBF
Contents: AGFD larval fish file

Field	Type	Size	Dec	Description
WACODE	N	4		
HAB	C	1		
SUB	C	1		
COVER	C	1		
TEMP	N	4		
GEAR	N	1		
MONTH	N	2		
DAY	N	2		
YEAR	N	2		
EFFORT	N	5		
STATION	C	5		
TIME	N	4		
SPECIES	C	3		
LENGTH	N	5		
WEIGHT	N	5		
COLNO	N	3		
DEPTH	N	4		
VELOCITY	N	4		
NAME	C	4		

File: AGFDHAB.DBF
Contents: AGFD habitat file

Field	Type	Size	Dec	Description
MONTH	N	2		
DAY	N	2		
YEAR	N	2		
NAME	C	20		
RIVERMILE	N	5		
POWER	C	1		
TIME	N	4		
SHORE	C	1		
HAB	C	1		
SUB	C	1		
VEG	C	1		
SPECIES	C	3		
AGE	C	1		

File: **AGFCATCH.DBF**
Contents: **AGFD catch file**

Field	Type	Size	Dec	Description
WACODE	N	4		
WATER	C	5		
GEAR	N	1		
DATE	N	6		
EFFORT	N	5		
STATION	C	5		
TIME	N	4		
SPECIES	C	3		
LENGTH	N	5		
WEIGHT	N	5		
SEX	C	1		
MAT	N	1		
TAGNO	N	10		
RECAPNO	N	10		

Relational Links

We do not know what relational links are used at this time.

COMMONALITIES IN EXISTING DATABASES

COMMON ELEMENTS

The researchers currently conducting fisheries investigations in Grand Canyon are collecting a wide variety of fisheries information from a number of different locations. Table 2 shows which researchers are collecting data in the mainstem Colorado River, the Little Colorado River, and other tributaries to the mainstem. The data collected include fish lengths and weights, habitat information, drift and food samples, movement and behavior observations, water quality measurements, etc. Table 3 shows the general types of data collected by the different researchers. The information pertaining to U of A was extracted from the four theses cited in the OVERVIEW OF DATABASES.

Table 2. Study locations of fisheries researchers in Grand Canyon.

	AGFD	ASU	USFWS	B/W	U of A	Historical
Mainstem	X			X		X
Little Colorado	X	X	X			X
Other Tribs			X		X	X

Table 3. General types of data collected by fisheries researchers in Grand Canyon.

	AGFD	ASU	USFWS	B/W	U of A	Historical
Fish Capture	X	X	X	X	X	X
Fish Sampling	X		X	X	X	X
Habitat Quantification	X		X	X	X	X
Water Quality	X		X	X	X	X
Invertebrates	X			X		
Food Habits (stomach)	X			X		X
Organic Quantification	X			X		
Behavior/Movement	X			X		X
Morphometrics/Meristics				X		X

The most common type of data collected by fisheries researchers is the fish collections information, which normally includes specifics for individual fish such as capture location, gear type, date, time, length, weight, sex, and spawning condition. In the following section, COMPATIBILITY OF COMMON ELEMENTS, we examine the specifics of the fish collections data of each researcher and compare them between researchers.

Hand in hand with the fish capture information goes the fish sampling information. Fish sampling can be carried out in many different ways and Table 4 shows which researchers conduct which types of sampling in Grand Canyon. Breaking down the fish sampling information to the level of fields in common is very difficult because of the many different ways researchers conduct such sampling. We do not attempt to break it down any further here.

Table 4. Types of fish sampling conducted by fisheries researchers in Grand Canyon.

	AGFD	ASU	USFWS	B/W	U of A	Historical
Trammel/Gill Nets	X	X		X	X	X
Hoop Nets	X	X	X	X	X	X
Minnow Traps	X		X	X	X	
Angling	X	X		X		X
Seining (Bag/Straight)	X	X	X	X	X	X
Electrofishing (Boat/Backpack)				X	X	X
Dip Net	X					
Larval Drift	X					

Tables 5-8 show further breakdowns of some of the other general types of data collected by fisheries researchers in Grand Canyon, but not to the level of database fields due to the complexity and variety of these types of data among the different researchers.

Table 5. Types of habitat quantification conducted by fisheries researchers in Grand Canyon.

	AGFD	ASU	USFWS	B/W	U of A	Historical
Physical Habitat Measurements	X		X	X	X	X
Surficial Habitat	X			X		X

Table 6. Types of invertebrate sampling conducted by fisheries researchers in Grand Canyon.

	AGFD	ASU	USFWS	B/W	U of A	Historical
Benthos	X					
Drift	X			X		
Zooplankton	X					

Table 7. Types of organic quantification conducted by fisheries researchers in Grand Canyon.

	AGFD	ASU	USFWS	B/W	U of A	Historical
Algae Chlorophyll	X					
Drift Biomass	X			X		
Sediment Analysis	X					

Table 8. Types of behavior and movement observations by fisheries researchers in Grand Canyon.

	AGFD	ASU	USFWS	B/W	U of A	Historical
Habitat Use	X			X	X	X
Long-Range Movement				X		
Local Movement and Activity	X			X		

Water quality information is another general type of data collected similarly among the different fisheries researchers. Most of the researchers use a Hydrolab Datasonde or Surveyor to collect water quality parameters such as temperature, conductivity, pH, dissolved oxygen, oxidation/reduction potential, and salinity. Information about water clarity is also commonly collected with secchi discs and turbidity meters. Like the fish capture information, the compatibility of water quality fields among the different researchers' databases is discussed in the section, COMPATIBILITY OF COMMON ELEMENTS.

COMPATIBILITY OF COMMON ELEMENTS

In the previous section we discussed some of the commonalities between the existing fisheries databases. Although the different researchers apparently conduct similar kinds of studies, they each have different objectives, methods, and procedures for collecting, organizing, storing and analyzing their data. The different types of data can be broadly categorized and compared, but when it comes to specific comparisons at the level of individual data fields, it becomes very difficult except for a couple of data sets that are similar between the researchers. The two data sets for which we were able to do this detailed comparison are the fish capture information and the water quality information. Tables 9 and 10 list the type of information commonly collected for these data sets, the field names used by each researcher for this information, and a detailed description of the format of the field.

One thing that the tables make clear is that not all the same information is collected by all of the researchers, nor is it collected in the same way, necessarily. For example, in Table 9 we can see that ASU does not record the side of the river in its location information, FWS records the side looking upstream, and B/W records the side looking downstream. We can also see that the field format may vary for the same information. The date is an example of this, with AGF storing month, day, and year in separate 2-digit fields, FWS using a dBASE date field, and B/W using a 6-character date. The flip side of different formats for the same information is a common format, but different codes used

Table 9. Compatibility of fish capture fields between databases of fisheries researchers in Grand Canyon.

Information	Researcher	Field	Description
Date	AGFD-MC		
	AGFD-LCR	RUN_MO; RUN_DA; RUN_YR	2-digits for each of month, day, year
	ASU	MONTH; DAY; YEAR	2-digits for each of month, day, year
	USFWS	DATE	dBase data field
	B/W	DATE	6-character date (YYMMDD)
Time	AGFD-MC		
	AGFD-LCR	RUN_HR; RUN_MM	2-digit for each of hour and minute
	ASU	HOUR	4-digit military time
	USFWS	TIME	4-digit military time
	B/W	TIME	4-digit military time
Location (coded)	AGFD-MC	STUDY	3-digit number in STUDY field
	AGFD-LCR	USFWS	USFWS transect code
	ASU	LOCATION	USFWS transect code
	USFWS	ID	Transect code and bank location looking upstream
	B/W		
River	AGFD-MC		
	AGFD-LCR	REACH	2-digit tributary code
	ASU	WACODE	2-digit AGFD tributary code
	USFWS		
	B/W	RIVER	2-character river code
River Mile	AGFD-MC		
	AGFD-LCR		
	ASU		
	USFWS		
	B/W	RM	Numeric river mile from Belknap Guide
Meters	AGFD-MC		
	AGFD-LCR	MILE	Meters from mouth of LCR
	ASU		
	USFWS		
	B/W	METER	Meters from mouth of tributary
Side	AGFD-MC		
	AGFD-LCR	SIDE	Bank location looking???
	ASU		
	USFWS		Bank location looking upstream
	B/W	SIDE	Bank location looking downstream
Species	AGFD-MC	SPECIES	3-character codes
	AGFD-LCR	SPECIES	3-character codes
	ASU	SPECIES	2 and 3-character codes
	USFWS	SPP	3-character codes
	B/W	SPECIES	2-character codes
Length	AGFD-MC		Total length in mm
	AGFD-LCR		Total length in mm
	ASU	LENGTH	Total length in mm
	USFWS	LNTH	Total length in mm
	B/W	TL/SL	Total length and standard length in mm

Information	Researcher	Field	Description
Weight	AGFD-MC	WEIGHT	Weight in grams
	AGFD-LCR	WEIGHT	Weight in grams
	ASU	WEIGHT	Weight in grams
	USFWS	WGHT	Weight in grams
	B/W	WT	Weight in grams for natives; lb/oz for non-natives
Sex	AGFD-MC	SEX	1-character code for male, female
	AGFD-LCR	SEX	1-character code for male, female, undetermined, not checked
	ASU	SEX	1-digit number of unknown, male, female
	USFWS	SEX	1-character code for male, female
	B/W	SEX	1-character code for male, female, immature, undetermined
PIT tag	AGFD-MC	TAG	10-character code
	AGFD-LCR	TAGNUM	10-character code
	ASU	TAG	10-character code
	USFWS	PIT	10-character code
	B/W	PIT_TAG	10-character code
Gear Type	AGFD-MC		
	AGFD-LCR	GEAR_TYP	2-character code (also fields for height, length, mesh)
	ASU	GEAR	1-digit code
	USFWS	GEAR	3-character code
	B/W	GEAR	2-character code
Habitat	AGFD-MC	HAB_CO	2-character code
	AGFD-LCR		
	ASU		
	USFWS		
	B/W		
Channel	AGFD-MC		
	AGFD-LCR	HABCHANN	2-character code
	ASU		
	USFWS		
	B/W	HAB1	2-character code
Primary	AGFD-MC		
	AGFD-LCR	HABTYPE	2-character code
	ASU		
	USFWS		
	B/W	HAB2	2-character code
Secondary	AGFD-MC		
	AGFD-LCR	HABTY2	2-character code
	ASU		
	USFWS		
	B/W		
Shoreline	AGFD-MC		
	AGFD-LCR		
	ASU		
	USFWS		
	B/W	HAB3	2-character code

Information	Researcher	Field	Description
Maturity	AGFD-MC	MATURITY	1-digit code
	AGFD-LCR	MATURITY	1-digit code
	ASU	MATURITY	1-digit code
	USFWS	REMARKS	recorded in remarks
	B/W	RIPE	2-character code
Mark/Recapture	AGFD-MC	MARK_RECAP	1-character code (mark or recapture)
	AGFD-LCR	MARK_REC	1-character code (mark or recapture)
	ASU		
	USFWS	RECAP	1-character (yes or no)
	B/W	RECAPTURE	1-character (yes or no)
Old Tag	AGFD-MC		
	AGFD-LCR	OLDTAG	1-character code (yes or no)
	ASU	RECAPTURE	10-character field for old tag number
	USFWS	REMARKS	recorded in remarks
	B/W	OLD_TAG	10-character field for old tag number
Other Marks	AGFD-MC		
	AGFD-LCR		
	ASU		
	USFWS	FIN	4-character fin clip code
	B/W	PIT; OLD_TAG	clip and punch info recorded in PIT_TAG and OLD_TAG field
Disposition	AGFD-MC	DISP	2-character code
	AGFD-LCR	DISPOSE	2-character code
	ASU		
	USFWS		
	B/W	DISP	2-character code
Parasites	AGFD-MC		
	AGFD-LCR	PARASITE	2-digit for number of parasites
	ASU		
	USFWS	REMARKS	recorded in remarks
	B/W	COMMENTS	recorded in comments
Photo/Video	AGFD-MC		
	AGFD-LCR		
	ASU		
	USFWS		
	B/W	PHOTO_VID	1-character code

Table 10. Compatibility of water quality fields between databases of fisheries researchers in Grand Canyon.

Information	Researcher	Field	Description
Date	AGFD-MC		
	AGFD-LCR	RUN_MO; RUN_DA; RUN_YR	2-digits for each of month, day, year
	ASU	MONTH; DAY; YEAR	2-digits for each of month, day, year
	USFWS	DATE	dBase data field
	B/W	DATE	6-character date (YYMMDD)
Time	AGFD-MC		
	AGFD-LCR	RUN_HR; RUN_MM	2-digit for each of hour and minute
	ASU	HOUR	4-digit military time
	USFWS	TIME	4-digit military time
	B/W	TIME	4-digit military time
Location (Coded)	AGFD-MC	STUDY	Last 3 digits of field
	AGFD-LCR		
	ASU		
	USFWS	CAMP	1-character code
	B/W		
River	AGFD-MC		
	AGFD-LCR		
	ASU		
	USFWS		
	B/W	RIVER	2-character river or tributary code
River Mile	AGFD-MC		
	AGFD-LCR		
	ASU		
	USFWS		
	B/W	RM	Numeric river mile from Belknap Guide
Meter	AGFD-MC		
	AGFD-LCR		
	ASU		
	USFWS	KM	Kilometers from month of LCR
	B/W	METER	Meters from mouth of tributary
Water Temperature	AGFD-MC	TEMP	2-digit number with 2 decimal places (°C)
	AGFD-LCR		
	ASU		
	USFWS	TEMP	3-digit number (°C)
	B/W	TEMP	2-digit number with 2 decimal places (°C)
pH	AGFD-MC	PH	1-digit number with 2 decimal places
	AGFD-LCR		
	ASU		
	USFWS	PH	4-digit number
	B/W	PH	2-digit number with 2 decimal places
Conductivity	AGFD-MC	COND	1-digit number with 3 decimal places
	AGFD-LCR		
	ASU		
	USFWS	COND	4-digit number (ms)
	B/W	COND	2-digit number with 3 decimal places

Information	Researcher	Field	Description
Dissolved Oxygen	AGFD-MC	DO PERSAT	3-digit number with 1 decimal place (% sat)
		DOMG PERL	2-digit number with 2 decimal places (mg/l)
	AGFD-LCR		
	ASU		
	USFWS	DO	4-digit number (ppm)
	B/W	DO	2-digit number with 2 decimal places
Oxidation/Reduction potential	AGFD-MC	REDOX	3-digit number
	AGFD-LCR		
	ASU		
	USFWS	ORP	4-digit number
	B/W	ORP	2-digit number with 3 decimal places
Salinity	AGFD-MC	SALINITY	1-digit number with one decimal place
	AGFD-LCR		
	ASU		
	USFWS	SAL	3-digit number (%)
	B/W		
Battery voltage of instrument	AGFD-MC	VOLTS	3-digit number with 1 decimal place
	AGFD-LCR		
	ASU		
	USFWS		
	B/W	BATT	2-digit number with 2 decimal places

by different researchers for the same information, such as 'PKF' (AGF) and 'KLF' (FWS) for plains killifish, and 'BRT' (ASU) and 'BNT' (FWS) for brown trout. See Appendix A - DATABASE CODE DEFINITIONS for a listing of the codes and their meanings for each researcher's database. There are some fields that are exactly compatible such as PIT tag numbers, which are always 10 characters, and fish weights, which are measured in grams.

The different researchers' water quality information described in Table 10 appears to be more compatible. Since the bulk of the water quality information is numerical, the main differences lie in the format of the data fields in terms of the number of digits and decimal places for the measurement values. The differences between the fields for date, time, and location are similar to what we saw with the fish capture data described in Table 9.

Although there are a number of apparent incompatibilities between the different researchers' data formats for fish capture and water quality information, most of them can be resolved by a simple translation. For instance, 2-character species codes can easily be translated into 3-character codes. Something like location information, however, involves more than a simple translation, partly because each researcher records location information in a different way, but also because river mile and meter locations are often imprecise. This can result in two researchers using different river mile designations for the same location. Other than this uncertainty about location information, the fish capture and water quality data can be made compatible with relatively straightforward translations. Phase II of the GCFIN Database will include more detailed discussion of how the fisheries databases, or partitions of them, can be integrated.

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APPENDIX A

DATABASE CODE DEFINITIONS

ARIZONA GAME AND FISH
Little Colorado River

REACH

022	Little Colorado River
020	Colorado above LCR
030	Colorado below LCR

MILE

Confluence at 61.5
Use meters above mouth for LCR

SIDE

L	Left (looking downstream)
R	Right (looking downstream)
C	Center

GEAR-TYPE

BS	Bag Seine
SS	Straight Seine
MT	Minnow Trap
HN	Hoop Net (round, no leads)
AN	Angling
DP	Dip Net

GEAR-H (height)

Record to the nearest ft.

GEAR-L (length)

Record to the nearest ft.

GEAR-M (mesh)

0.03	1/32 in.
0.06	1/16 in.
0.12	1/8 in.
0.25	1/4 in.
0.50	1/2 in.
0.75	3/4 in.
1.00	1 in.
1.50	1-1/2 in.
2.00	2 in.
E	Experimental

AREAL EFFORT-LEN

Length of seine haul to nearest meter
Length of dip net sweep to nearest cm

AREAL EFFORT-WID

Width of seine haul to nearest meter
Width of dip net to nearest cm

CHANNEL TYPE

MC	Main Channel
SC	Side Channel
TS	Tributary Stream
TM	Tributary Mouth

1° HABITAT

CB	Connected backwater
IB	Isolated backwater
ED	Eddy
RI	Riffle
RU	Run
EW	Edgewater
CO	Cove
SC	Springflow Channel (arising from sidechannel)
PO	Pool

2° HABITAT

PL	Plunge Pool
DP	Dammed Pool
PW	Pocket Water (pool)
TP	Travertine Pool
LP	Lateral Scour Pool
PP	Peripheral Pool
CA	Cascade (riffle)

SUBSTRATE

BD	Bedrock (>4.096 m)
BO	Boulder (0.256-4.096 m)
CO	Cobble (64-256 mm)
PB	Pebble (32-64 mm)
GR	Gravel (2-32 mm)
SA	Sand (0.062-2 mm)
SI	Silt (4-62 µm)
CL	Clay (0.24-4 µm)
DE	Detritus
CC	Calcium carbonate floc
TR	Travertine (tufa)

FEATURES

DE	Depth >0.5 m
TU	Turbulence
LE	Ledge
BO	Boulder
UB	Undercut Bank
TD	Turbidity
OV	Overhanging Vegetation
IV	Instream Vegetation
WD	Woody Debris
DA	Dam (upstream)

SPECIES

BHS	Bluehead mountain sucker
FMS	Flannelmouth sucker
RBS	Razorback sucker
SUC	Unidentified sucker
HBC	Humpback chub
SPD	Speckled dace
FHM	Fathead minnow
RSH	Red shiner
CRP	Carp
PKF	Plains killifish
CCF	Channel catfish
RBT	Rainbow trout
UID	Unidentified species
SHY	Sucker hybrid

SEX

M	Male
F	Female
U	Undetermined
N	Determination not attempted

MAT (maturity)

3	Ripe-gametes extrudable
4	Spent female-fish has expelled gametes
5	Tuberculate (not ripe)
6	Undeterminable
7	Not attempted

PAR #

Number of external parasites (Lernea) visible
Record location codes in comments!

EXT-Y/N (external tag) - Record type code, color code, and number in Comments

F	Floy tag (type)
C	Carlin tag (type)
Y	Yellow
G	Green
B	Blue
O	Orange
R	Red

HEAD-STOM - Record 2-letter code followed by 2-digit number

HE	Head, ethanol
SF	Stomach, formalin
BE	Body (entire fish), ethanol
BF	Body (entire fish), formalin
HS	Head and stomach preserved in ethanol and formalin, respectively

DIS (disposition)

RA	Released alive
DN	Dead, not taken
DP	Dead, preserved
DS	Dead, skeletonized
SP	Sacrificed, preserved
SS	Sacrificed, skeletonized
MN	Mortality, not taken
MP	Mortality, preserved
MS	Mortality, skeletonized

COMMENT CODES

00	Fishless
01	Coloration
02	Fishless w/ qualification
03	Equipment failure
04	External tag
05	Body scars/bruising
06	Predator bite scars
07	Fin condition
08	Pulled net
09	Pit tag/external tag scar
10	Upper caudal + RP2 fin clips
11	Upper caudal + LP2 fin clips
12	Lower caudal + RP2 fin clips
13	Lower caudal + LP2 fin clips
14	Dorsal fin punch
15	Caudal fin punch
16	Radio tagged
20	Escaped
21	PIT tagged but number not recorded
22	More than one tag injected
23	Collected from longitudinal survey
24	Proto larva
25	Meso larva
26	Meta larva

LENGTH

01	<6 mm
02	6-10 mm
03	11-20 mm
04	21-30 mm
05	31-40 mm
06	41-50 mm
07	51-60 mm
08	61-70 mm
09	71-80 mm
10	81-90 mm
11	91-100 mm
etc	

HABTYPE

PP	Periferal pool
VS	Vegetated shoreline
OS	Non-vegetated shoreline
SC	Spring-flow channel

DRIFT AND VISCERA INVERTEBRATE CODE SHEET

INSECTS	
Diptera	DPA
Simulidae	SIM
Chironomidae	CHI
Empididae	EMP
Ceratopogonida	CPG
Dixidae	DIX
Dolichopodidae	DOL
Sciaridae	SCI
Ephydridae	EPY
Schizophora-DIV	SCZ
Trixoscelidae	TRX
Hemiptera	HMA
Gerridae	GER
Veliidae	VEL
Miridae	MIR
Tingidae	TNG
Berytidae	BEY
Saldidae	SAL
Hebridae	HEB
Mesoveliidae	MES
Macroveliidae	MAC
Homoptera	HOM
Cicadellidae	CDL
Aphididae	APH
Psyllidae	PSY
Trichoptera	TRI
Hydropsychidae	HPS
Hydroptilidae	HPT
Hymenoptera	HYM
Encyrtidae	ENC
Pteromalidae	PTE
Formicidae	FOR
Braconidae	BRA
Eulophidae	EUL
Apoidea	APO
Eurytomidae	EUR
Coleoptera	CLA
Elmidae	ELM
Dryopidae	DRY
Chrysomelidae	CHR
Curculionoidae	CUR
Hydrophilidae	HYP
Ephemeroptera	EPH
Baetidae	BAT
Siphlonuridae	SIP
Megaloptera	MEG
Corydalidae	CYD
Embioptera	EMB
Odonata	ODO
Gomphidae	GPH
Thysanoptera	THY
Thripidae	THR
Phloeothripidae	PHL
Collembola	COL
Psocoptera	PSO
Plecoptera	PLE
Neuroptera	NEU
Thysanura	THU
Orthoptera	ORT
Lepidoptera	LEP
Stretsiptera	STR
Isoptera	ISO
Mallophaga	MLO

OTHERS	
Araneida	ARA
Acarina	ACA
Hydracarina	HYD
Ostrocoda	OST
Amphibia	AMP
Bufo	BFO
Mollusca	MOL
Bivalvia	BIV
Gastropoda	GAS
Tapeworm(s)	TPW
Nematoda	NEM
Annelids	ANN
Hirundea	HIR
Oligochaeta	OLI
Rotifera	ROT
Cladocera	CLC
Copepoda	COP
Taxa	TAX
Chlorohydra	HYA

WHOLE SAMPLE	
Fish(UKN)	FFF
Sucker	SUW
Flannel Mth	FMW
Bluehead	BHW
Speck. Dace	SPW
Humpback Chub	HBW
Fathead Minn.	FHW
Killifish	PKW
Catfish	CCW
Carp	CRW

QUARTER SAMPLE	
FISH (UKN)	FHS
Sucker	SUC
Flannel Mth	FMS
Bluehead	BHS
Speck Dace	SPD
Humpback Chub	HBC
Fathead Minn.	FHM
Killifish	PKF
Catfish	CCF
Carp	CRP
Eggs(UKN)	EGG
Fish eggs-100%	EEE
Fish eggs-25%	EGF
Insect eggs	EGI
Amph. eggs	EGA

MISCS.	
Body parts	BPS
Pollen	POL
Seeds	SEE
Crustacea	CRU
Algae	ALG
Other Misc. Org.	OMO
Detritus	DET
Sand, Gravel	ROC
Empty	EPT

LIFE STAGE	
Adult	A
Pupae	P
Larva	L
Nymph	N
Prolarva	R
Mesolarva	M
Metalarva	T
Juvenile	J

MATURITY	
No Maturity	0
Many Sm eggs	1
Mature	2
Ripe	3
Spent	4
Unknown Mat.	6

PARASITE CODES	
None	0
1-10	1
11-100+	2

ARIZONA GAME AND FISH
Mainstem Colorado River

AMB_LITE: Ambient Light Codes

SU	Sunny
PC	PTly Cloudy (<50% cloud cover)
CL	Cloudy (>50% cloud cover)
SH	Shade
NI	Night
ML	Moonlight
DN	Dawn
DK	Dusk

DISP: Disposition codes

RA	Released Alive
MN	Mortality
MP	Mortality, Preserved
SP	Sacrificed, Preserved
OB	Observed

FLOW_CD: Flow Codes

AC	Ascending
DC	Descending
SH	Stable High
SL	Stable Low

GEAR_CD: Gear codes

BS	Small Bag Seine 15' x 6' x 1/8" (1/32" bag mesh)
BL	Large Bag Seine 30' x 6' x 1/4" (1/8" bag mesh)
SS	Small Straight Seine 15' x 4' x 1/8"
SL	Large Straight Seine 30' x 6' x 1/16"
KS	Kick Seine 3' x 3' x 1/32"
DS	Small Mesh Dip Net 1/16"
DL	Large Mesh Dip Net 3/16"
MH	Mini-Hoop Net 1.5' x 4' x 3/8"
HN	Hoop Net 3' x 5' x 3/8" x 40' wings
TN	Trammel Net (Set)
TS	Trammel Net (Used As A Seine)
LD	Larval Drift
MT	Minnow Trap
AN	Angling

HAB_CD: Habitat Codes

Backwaters

BE	Backwater Eddy
BW	Backwater
BM	Backwater Mouth - Connected Mouth
BC	Backwater Center - Connected Center
CB	Connected Backwater
CC	Connected Center
CE	Connected Eddy
CF	Connected Foot
CM	Connected Mouth
DW	Dewatered (used for trap sets)
IB	Isolated Backwater
IP	Isolated Pool
SC	Side Channel

Mainchannel

BF	Beach Face
BO	Boulder Shoreline
CO	Cove
DM	Dewatered (used for trap sets)
ED	Eddy
MC	Mainchannel
ME	Mainchannel Eddy
MR	Main River
MS	Mainstream
SC	Side Channel

Tributaries

DT	Dewatered (used for trap sets)
ED	Eddy
PO	Pool
RA	Rapid
RI	Riffle
RU	Run
TM	Tributary Mouth
TS	Tributary Side Channel
PL	Pool
TS	Tributary Side Channel
TB	Tributary

LIFE_STAGE: Life stage codes for diet analysis

A	Adult
P	Pupae
L	Larva
N	Nymph
R	Prolarva
M	Mesolarva
T	Metalarva
J	Juvenile
U	Unknown

MATURITY

0	Larval, Juvenile
1	Adult, Non-breeding
2	Gravid
3	Ripe
4	Spent
5	Tuberculate
6	Undetermined
7	Not Attempted
8	High Color

PARASITE

0	None
1	1-10
2	11-100+

REACH

010	Mainstem: Glen Canyon Dam to Lees Ferry (RM 0)
011	Paria River (RM 0.9)
020	Mainstem: Lees Ferry to Little Colorado River (RM 61.5)
021	Nankoweap Creek (RM 52.2R)
022	Little Colorado R. (RM61.5L)
030	Mainstem: LCR to Bright Angel Creek (RM

87.62)

031	Clear Creek (RM 84.03R)
032	Bright Angel Creek (RM 87.62R)
040	Mainstem: Bright Angel to National Canyon (RM 166.4)
401	Pipe Creek (RM 88.95L)
041	Crystal Creek (RM 98.04R)
042	Shinumo Creek (RM 108.6R)
402	Elves Chasm (RM 116.5L)
403	Stone Creek (RM 131.8R)
043	Tapeats Creek (RM 133.83R)
044	Deer Creek (RM 136.25R)
045	Kanab Creek (RM 143.5R)
404	Olo Canyon (RM 145.5L)
046	Havasu Creek (RM 156.93L)
047	Diamond Creek (RM 225.6L)
050	Mainstem: National Canyon to Diamond Creek (RM 225.6)
060	Mainstem: Diamond Creek to Lake Mead (RM 270?)
061	Travertine Creek (RM 229.0L)
062	Spencer Creek (RM 246.0)

Sex Codes

F	Female
M	Male

SPECIES

Common Species

BBH	Black Bullhead
BGS	Bluegill
BHS	Bluehead Sucker
BKT	Brook Trout
BNT	Brown Trout
CCF	Channel Catfish
CRP	Common Carp
CUT	Cutthroat Trout
FMS	Flannelmouth Sucker
GSH	Golden Shiner
HBC	Humpback Chub
LMB	Largemouth Bass
PKF	Plains Killifish
RBS	Razorback Sucker
RBT	Rainbow Trout
RSH	Red Shiner
SMB	Smallmouth Bass
SPD	Speckled Dace
STB	Striped Bass
TFS	Threadfin Shad
UTC	Utah Chub
YBH	Yellow Bullhead
SUC	Sucker (unidentified)
UID	Unidentified

SUBST_CD: Substrate Codes

SI	Silt
SA	Sand
GR	Gravel
PE	Pebble
CO	Cobble
BO	Boulder
BD	Bedrock

TAG: Tag Codes and Fin Clips/Punches

Tag Types

C	Carlin
F	Floy
P	PIT

Fin Clips/Punches

D	Dorsal
UC	Upper Caudal
LC	Lower Caudal
CD	Caudal
RP2	Right Pelvic
LP2	Left Pelvic

TAXA

ALG	Algae
ACA	Acarina
AMP	Amphibia
ANN	Annelids
APD	Amphipod
APH	Aphididae
APO	Apoidea
ARA	Araneida
BAT	Baetidae
BEY	Berytidae
BFO	Bufo
BIV	Bivalvia
BPS	Body parts
BRA	Braconidae
CDL	Cicadellidae
CHI	Chironomidae
CHR	Chrysomelidae
CIL	Ciliate
CLA	Coleoptera
CLC	Cladocera
COL	Collembola
COP	Copepoda
CPG	Ceratopogonidae
CRU	Crustacean
CST	Cestoda
CUR	Curculionoidae
CYD	Corydalidae
DET	Detritus
DIA	Diatom
DIX	Dixidae
DOL	Dolichopodidae
DPA	Diptera
DRY	Dryopidae
ECT	Ectoproct
ELM	Elmidae
EMB	Embioptera
EMP	Empididae
ENC	Encyrtidae
EPH	Ephemeroptera
EPT	Empty
EPY	Ephydridae
EUL	Eulophidae
EUR	Eurytomidae
FOR	Formicidae
GAS	Gastropoda
GER	Gerridae
GPH	Gomphidae
HEB	Hebridae
HIR	Hirundea
HMA	Hemiptera
HOM	Homoptera
HPS	Hydropsychidae
HPT	Hydroptilidae
HYA	Chlorohydra
HYD	Hydracarina
HYM	Hymenoptera
HYP	Hydrophilidae
ISO	Isoptera
LEP	Lepidoptera
MAC	Macroveliidae
MEG	Megaloptera
MES	Mesoveliidae
MIR	Miridae
MLO	Mallophaga
MOL	Mollusca
NAP	Copepod nauplius
NEM	Nematoda
NEU	Neuroptera
ODO	Odonata
OLI	Oligochaeta
OMO	Other Misc. Org.
ONP	Ostracod nauplius
ORT	Orthoptera
OST	Ostrocoda
PHL	Phloeothripidae
PLE	Plecoptera
POL	Pollen
PRO	Protozoan
PSO	Psocoptera
PSY	Psyllidae
PTE	Pteromalidae
ROC	Sand, Gravel
ROT	Rotifera
SAL	Saldidae
SCI	Sciaridae
SCZ	Schizophora
SEE	Seeds
SIM	Simulidae
SIP	Siphlonuridae
STR	Stretsiptera
THR	Thripidae
THU	Thysanura
THY	Thysanoptera
TIP	Tipulidae
TNG	Tingidae
TRI	Trichoptera
TRX	Trixoscelidae
VEL	Veliidae
VOL	Volvox

ARIZONA STATE UNIVERSITY

CAMP

C	Confluence
P	Powell
S	Salt

TRIP

Numbered sequentially from 1-12+ for a given year

YEAR CODE

A	1991
B	1992
C	1993
etc	

WACODE

22	Little Colorado River

LOCATION

USFWS transect code and/or generic site name

GEAR

2	Trammel
3	Seine
5	Hoop
6	Angling

SPECIES

RBT	Rainbow trout
BRT	Brown trout
HBC	Humpback chub
STB	Striped bass
FHM	Fathead minnow
RGK	RioGrand killifish
CRP	Common carp
SD	Speckled dace
FMS	Flannelmouth sucker
CCF	Channel catfish
BHS	Bluehead sucker
BBH	Black bullhead
YBH	Yellow bullhead
RBS	Razorback sucker
BG	Bluegill

SEX

0	Unknown
1	Male
2	Female

MATURITY

0	Immature
2	Mature
3	Ripe
4	Spent
6	Mortality

U.S. FISH AND WILDLIFE SERVICE

GEAR

AHP	ASU hoopnet
MNP	FWS mini-hoopnet
MTP	FWS minnow trap
SEN	FWS seine
TRN	FWS transect
ICM	ICM meter
HDL	Hydrolab
HDLL	Hydrolab with logger

GEARD (mesh, # hoops, hoop diameter)

mesh	25	1/4"
	50	1/2"
# hoops	4	
	5	
	6	
	etc.	
diameter	50	
	60	
	70	
	80	
	90	

CUR

0	none (0-.02 m/s)
1	very slow (.02-.10 m/s)
2	slow (.10-.30 m/s)
3	moderate (.30-.70 m/s)
4	fast (.70-1.20 m/s)
5	very fast (>1.20 m/s)

CC (current comments)

E	backcurrent or eddy
T	turbulent flow
P	plunge pool or waterfall
+	slightly faster current
-	slightly slower current

SUB

M	marl
0	silt or marl (<.06 mm)
1	silt-sand (.07-.10 mm)
2	sand (.11-2.0 mm)
3	gravel (2.1-15 mm)
4	pebble (16-31 mm)
5	rock (32-100 mm)
6	cobble (101-255 mm)
7	small boulder (256-1000 mm)
8	boulder (1-3 m)
9	large boulder (>3 m)
10 or T	travertine
11	bedrock

SBC (substrate descriptor)

M	marl
T	travertine
H	rough or horny travertine
Q	travertine dam or terrace
B	smooth or bottom/basement travertine
V	vegetation
A	algae
P	pondweed
R	roots
F	phragmites stems
C	cattail stems
S	shrubs or small tree
D	detritus
W	wood
L	leaves
G	dry ground or land
Z	particle is composed of solid travertine

M

0	20m transect
1	100m transect

CVR

0	none
1	slight
2	little
3	moderate
4	extensive
5-8	deep water cover
negative values	unsuitable habitat

VER

0	no vertical structure
1	V in OVH and depth 10-25 cm
2	V in OVH and depth 25-50 cm
3	V in OVH and depth 50-100 cm
4	V in OVH and depth >100 cm
+1	E and O,L,U, or W in OVH and depth >25 cm

VEG

0	no vegetation
1	small macrophytes or filamentous algae
2	roots and small emergent vegetation, rushes
3	large emergent vegetation

MAR

0	no marl
1	mixture of marl and silt or sand
2	marl coating on larger substrates
3	thick marl deposit as primary substrate

TRA

0	no travertine
1	travertine coated substrates
2	smooth or rough travertine as primary substrate
3	rough travertine and solid travertine masses associated with travertine dams and reefs

SHA

0	<10% or no shade
1	10-50% shade
2	50-75% shade
3	>75% shade

DEB

0	no debris

1	detritus and leaves
2	sticks and small logs
3	large submerged logs

PER

M	midnight sample (22:00-02:00)
A	night time sample (02:00-10:00)
P	daytime sample (10:00-22:00)

SPP

HBC	humpback chub
BHS	bluehead sucker
FMS	flannelmouth sucker
SPD	speckled dace
CCF	channel catfish
FHM	fathead minnow
CCP	common carp
KLF	plains killifish
RBT	rainbow trout
BNT	brown trout
CUT	cutthroat trout
GSF	green sunfish
LMB	largemouth bass
RBS	razorback sucker
RSH	red shiner

FIN

UCRP	upper caudal, right pectoral
UCLP	upper caudal, left pectoral
LCRP	lower caudal, right pectoral
LCLP	lower caudal, left pectoral

CAMP

S	Salt camp
P	Powell camp
A	Atomizer
B	Blue Springs
C	confluence

SECCHI

0	<0.5
1	0.5-1.0

AMBIENT LIGHT

SU	Sunny
CL	Cloudy (> 50% cloud cover)
PC	Partly cloudy (< or 50% cloud cover)
SH	Shadow
NI	Night
ML	Moonlight
DD	Dawn/dusk

DISPOSITION

RA	Returned alive (no radio implant)
RI	Returned with newly implanted radio
RR	Returned with active radio transmitter
RN	Returned with non-active radio transmitter (removed external antennae but did not re-implant)
RS	Returned alive with stomach contents removed
DR	Dead, released (non-native fish)
DP	Dead, preserved
DS	Dead, stomach contents preserved

FLUCTUATIONS OR FLUCT

RI	Rising
FA	Falling
SL	Steady at a low stage
SH	Steady at a high stage

GEAR

EL	Electrofishing
FR	Frame net
SA	10'x3'x1/8" seine
SB	30'x4'x1/4" seine
SG	30'x5'x1/4" seine
DL	Larval fish drift net
DR	Invert drift net
SU	Surber
AQ	Aquarium net
KS	Kick screen
TK	75'x6'x1"x12" Trammel net
TL	75'x6'x1 1/2"x12" Trammel net
TF	Floated Trammel net RECORD AREA SAMPLED
TM	50'x6'x1"x12" Trammel net
TN	50'x6'x1.5"x12"
GM	100'x6'x2" gill net
GP	100'x6'x1 1/2" gill net
GX	100' experimental gill net
GZ	60' experimental gill net
GY	50'x6'x1.5" gill net
GF	Floated gill net RECORD AREA SAMPLED
MT	Minnow trap
HL	Large hoop net (4' diam.)
HM	Medium hoop net (3' diam.)
HS	Small hoop net (2' diam.)
AN	Angling
TW	75'x6'x1/2"x10
TZ	TL with attached floats
TY	TK with attached floats

HAB1: General habitat

MC	Main channel
TS	Tributary stream
SC	Side channel

HAB2: Specific habitat

ED	Eddy
EM	Embayment
RI	Riffle
RU	Run
SH	Shoreline
PO	Pool
RC	Return channel

HAB3: Shoreline habitat

TS	Talus scree
SW	Shear wall
LE	Ledge
BE	Bedrock
SI	Silt
SA	Sand
CO	Cobble
BO	Boulder field
CB	Cut bank
VG	Vegetation
DF	Debris flow

RIPE: State of gonadal maturity of fish

TU	Tubercled only
TC	Tubercled and colored
MI	Running milt
EG	Expressible eggs
SP	Spent
CO	Colored only

SUB1: Dominant substrate

SI	Silt
SA	Sand
GR	Gravel
CO	Cobble
BO	Boulder
BE	Bedrock
OR	Organic matter

SUB2: Secondary substrate

SI	Silt
SA	Sand
GR	Gravel
CO	Cobble
BO	Boulder
BE	Bedrock
OR	Organic matter

TURBIDITY OR TURB

H	High secchi = < 0.5m
L	Low secchi = > 0.5m

WEATHER

SU	Sunny

CS	(SU) clear skies
CL	Cloudy (> 50% cloud cover)
PC	Partly cloudy (< or 50% cloud cover)
OV	Overcast or foggy
RA	Raining
SN	Snowing

SPECIES CODE OR SPECIES: Code for fish species

HB	Humpback chub
FM	Flannelmouth sucker
BH	Bluehead sucker
SD	Speckled dace
RZ	Razorback sucker
FV	Flannelmouth sucker variant
FZ	Flannelmouth X razorback hyb.
FH	Fathead minnow
CC	Channel catfish
BB	Black bullhead
CP	Carp
RB	Rainbow trout
BR	Brown trout
BK	Brook trout
PK	Plains killifish (Fundulus zebrinus)
SB	Striped bass
WE	Walleye
FR	Flannelmouth X razorback hybrid
SU	Unidentified sucker
YB	Yellow bullhead
BG	Blue gill
GA	Gambusia
GS	Green sunfish
LB	Largemouth bass
RS	Redshiner
TS	Threadfin shad

OLD TAG

UCRP2	Upper caudal plus RP2
UCLP2	Upper caudal plus LP2
LCRP2	Lower caudal plus RP2
LCLP2	Lower caudal plus LP2
DP	Dorsal punch
UCP	Upper caudal punch
LCP	Lower caudal punch
PIT	PIT tag number

Floy tag number
Carlin tag number

REACH

1	LCR
2	Granite Gorge
3	Lower

RIVER

CO	Mainstem Colorado River
LC	Little Colorado River
BA	Bright Angel Creek
KN	Kanab Creek
HV	Havasu Creek
TP	Tapeat's Creek
SH	Shinumo Creek
DC	Deer Creek
NK	Nankoweep
CL	Clear Creek
CR	Crystal Creek
ST	Stone Creek
CB	Carbon Creek

SAMPLE TYPE

E	Electrofishing
N	Gill/Trammel nets
S	Seining
T	Traps,i.e. hoop nets, minnow traps

SEX

M	Male
F	Female
I	Immature
U	Undetermined

SIDE

R	River right (looking downstream)
L	River left (looking downstream)
C	Center (tributary hoop net sets)

CONFIDENCE

1	High, excellent reception
2	Low, poor reception
3	Only a few "hits" use for location only

COVER

OB	Overhanging bank
SV	Streamside vegetation
NC	No cover

MODE

IM	Implant
LO	Locate
2H	2-hour
24	24-hour
TF	Test flow